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93-ERB-043

Mr. Paul T. Day
Hanford Project Manager
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99352

Mr. David B. Jansen, P.E.
Hanford Project Manager
State of Washington
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Dear Messrs. Day and Jansen:

RESPONSE TO THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) AND THE STATE OF WASHINGTON DEPARTMENT OF ECOLOGY'S (ECOLOGY) REVIEW OF THE 200 WEST GROUNDWATER AGGREGATE AREA MANAGEMENT STUDY REPORT (AAMSR) DRAFT A

This letter transmits the responses to comments received from EPA and Ecology on Draft A of the 200 West Groundwater AAMSR.

If you have any questions, please contact Mr. P. M. Pak (509) 376-4798.

Sincerely,

Steven H. Wisness
Hanford Project Manager

ERD:PMP

Enclosure

cc w/encl:
B. A. Austin, WHC
C. Cline, Ecology (2 copies)
A. DeAngeles, PRC
M. K. Harmon, EM-442
B. Kane, Parametrix
D. R. Sherwood, EPA
J. Sprecher, Brown and Caldwell
D. D. Teel, Ecology (3 copies)

cc w/o encl:
R. A. Carlson, WHC
R. E. Lerch, WHC
J. L. Monhart, EM-442

ENVIRONMENTAL RESTORATION ENGINEERING
COMMENT RECORD FORM

1. Date 11/18/92 2. Page 1 of 83

3. Document Title/Number 200 West Groundwater Aggregate Area Management Study Report, Draft A.

4. Lead Engineer/Scientist D Parker, WHC / P Pak, DOE-RL 5. Organization

6. Location/Phone/MSIN

7. Reviewer D. Goswami, Ecology / D. Sherwood, EPA 8. Organization
Sign and Print Name Date

9. Location/Phone/MSIN

10. The document was reviewed, and the reviewer had no comments.

Reviewer _____ 11. Date _____

12. I have reviewed the disposition of comments with the Lead Engineer/Scientist.

Reviewer _____ 13. Date _____

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
	GENERAL COMMENTS In general, the report thoroughly addresses the scope of the 200 West Groundwater Aggregate Area Management Study (AAMS). The following statements summarize our general concerns with the report:	
1	The primary deficiency of the report was that data gathered during the study to verify and evaluate the existing nature and extent of contamination beneath 200 West Area waste sites was not available during report preparation. The geophysical data would have been valuable in supporting the breakthrough of contaminants from the vadose zone into the groundwater. This data would lend support to the calculations used to support contaminant release to the groundwater and help evaluate the distribution of gamma-emitting radionuclides in or near the water table.	Accept. While it would have been better to have all the data available in time for inclusion in the report, scheduling of this activity did not allow this. Evidence of breakthrough will be addressed in the final field report scheduled to be released December 1992. This issue will be further addressed in the 200-UP-1 and 200-ZP-1 LFI Work Plans.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
2	Additional information dealing with continued discharges of Hanford liquid effluents is required. Most wastewater discharges in the 200 West Area are scheduled to cease prior to June 1995. Many of these discharges have severe flow restrictions between now and 1995 and still others will undergo early treatment prior to rerouting. The current discussion of existing liquid discharges is limited to a brief summary of Project W-049 and its associated discharges. Additions need to be made to Chapter 2 that reflect the substantive requirements of the M-17 milestone for 200 West Area liquid effluents.	Accept. A paragraph will be inserted before the existing text to describe the requirements of the Tri-Party Agreement Milestone M-17 for restricting and ultimately ceasing most effluent discharges in the 200 West Area. The role of both the W-049 and C-018H in treating liquid effluents prior to discharge to soil or surface water will be described further.
3	The criteria used to evaluate groundwater quality data collected by the groundwater monitoring program should be included in a separate table for chemical compounds identified in Table 4-1 or in the same table (Table 4-1). The criteria should be provided to evaluate whether the compounds that exceeded groundwater quality standards have been properly identified. The lack of clearly identified water quality standards have also created some confusion with regard to the plume maps and the interpretation of nature and extent of contamination. For each contaminant plume discussed in the report, the water quality criteria and the contour level needs to be clearly identified. Without the criteria, the contour interval, and the quantitation limit the reader is left with a significant degree of uncertainty as to the extent of contamination.	Accept. Standards (drinking water or equivalents) will be added to Table 4-1 and the plume maps.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
4	Average chemical concentration values at each well are compared with groundwater quality criteria to identify contaminants of concern and to indicate the extent of gross contamination for each constituent. This approach is acceptable for screening and prioritization of groundwater contaminate plumes, but this method is inconsistent with the Hanford baseline risk assessment methodology for determining contaminants of concern. The approved method requires that maximum detected contaminant concentrations be compared to risk-based concentrations (groundwater quality criteria in this case) and that contaminants present in concentrations that exceed groundwater quality criteria are retained as contaminants of concern.	Accept. The averaging process was used for the purposes of this screening (scoping) effort which is acceptable as indicated in the comment. Maximum sample values are found in Table 4-1 (for the well with the maximum average) and in Table A-2 for the entire history of sampling in the aggregate area.
5	Well construction information including depths and screened intervals are not consistent between reports referenced in this document. Accurate information about the screened interval is an important factor in interpreting data presented in this report. Data pertaining to depths and screened interval need to be reconciled.	Accept. Data will be checked and updated as necessary.
6	Although EPA and Ecology agree with the approach used to identify contaminant plumes as candidates for ERAs and IRMs, in certain cases sufficient information may not be available to develop remedial action plans. These deficiencies may be in terms of data gaps such as extent of contamination with depth, the impacts of proposed actions on adjacent contaminant plumes, or the availability of remedial technologies. These factors will likely have a profound influence on potential for near-term remediation of groundwater contamination beneath the 200 West Area.	Accept. These types of data needs are recognized and it is planned that they will be addressed in subsequent LFI Work Plans or as a characterization effort as part of an IRM Plan. The vertical extent of the U/Tc/N IRM plume is being planned as an FY 1993 investigation activity.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
7	Water quality and hydrologic data for the deep portion of the unconfined aquifer and the confined aquifer system represents a major unknown. This information may be critical for remediation of Dense Nonaqueous Phase Liquids (DNAPLs) disposed to the soil column in the Z-Plant area. Identification of locations where DNAPLs may be pooling is a near-term need. The program to characterize the extent of DNAPL contamination (carbon tetrachloride, chloroform, and trichloroethylene et.al.) in the deeper portion of the groundwater flow system will require a well thought out plan to limit the potential to create pathways for DNAPLs to reach those depths. EPA has issued guidance for investigation, interim action, and remedy implementation for Nonaqueous Phase Liquid Contaminants. The approach outlined in EPA Memorandum on Groundwater Remediation at Superfund Sites, May 27, 1992 (Directive No. 9283.1-06) should be used as guidance for development of the 200-ZP-1 operable unit investigation.	Accept. The EPA Directive cited will be recognized in the 200-ZP-1 Work Plan.
8	In Chapter 9, Recommendations, a wide variety recommendations are made to fill data gaps, to prioritize investigations, and to identify groundwater operable units. Recommendations to fill data gaps are only given in the most general terms and serve to downplay the significance and the magnitude of the data gaps. EPA and Ecology will use these recommendations to guide the scope of ERAs, IRMs, and LFIs, but the final decision on the appropriate scope of these activities will rest with the lead agency. Recommendation on operable unit definition and priorities will require further discussion and agreement by all three parties. This activity will be best performed after the review of the 200 East Groundwater Aggregate Area Management Study Report.	Accept. Comment noted. Specific data needs will be developed as part of the Work Plan process (e.g. the 200-UP-2 work plan).

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	TECHNICAL COMMENTS	
1	Section 1.2.1 Third paragraph on page 1-4 **Comment:** There seems to be some confusion concerning 200 North Source Unit groundwater. In the paragraph it is referenced as "...and two groundwater aggregate areas delineated in the 200 East, West, and North areas." In the following paragraph, it is listed as one of the eight source aggregate areas. Since 200 North groundwater is not addressed in the 200 West Groundwater report, will it be covered in the 200 East Groundwater AAMS report? **Recommendation:** Please clarify where the 200 North groundwater will be addressed.	Accept. Potential sources in the 200 North Area are covered by the 200 East Groundwater Aggregate Area. No change to report: Section 1 has already been finalized.
2	Section 2.1 Last paragraph on page 2-1 **Deficiency:** The 200 West Area areal extent is "loosely defined" and includes as much of the administrative 600 Area "as needed." Yet the MCL for carbon tetrachloride, "has been exceeded over the entire area of the plume." (Section 4.1.1.6.7.) **Recommendation:** Define the boundary of the 200 West groundwater unit including the 600 Area when groundwater is impacted. State if there has been any overlap observed between the 200 West and 200 East groundwater plumes.	Accept. The 200 West Groundwater Aggregate Area extends as far as contaminant plumes (exceeding standards) extend from facilities in the 200 West Area (except where they may cross-over into the 200 East Area). It is inappropriate to define this in a figure in Section 2, however, because plume extents are not addressed until Section 4.1.
3	Section 2.2.4 Page(s) 2-5 Lines 27..29 **Deficiency:** Reference to the "sealed canyon...entombed in the building" is unclear. **Recommendation:** Define the "sealed canyon," or otherwise clarify the sentence.	Accept. Sentence will be clarified. O/C

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
4	Section 2.3 Page(s) 2-9 Lines 4-8 **Deficiency:** The discussion of unplanned releases states that only those releases of sufficient volume to reach the water table are of interest. This should not be a criteria for eliminating potential contaminants of the ground water. It might be presumed that these unplanned releases were located in areas where other artificial recharges occurred and, thus the driving force to move contaminants down to the ground water could come from other sources. **Recommendation:** Qualify this paragraph to allow for potential driving forces, other than the actual unplanned releases. The actual contents and area of release of the unplanned discharges then would require evaluation before they could be eliminated as potential contaminants of the ground water.	Accept. Paragraph will be altered to indicate that unplanned releases which potentially could reach the water table are of interest. For most unplanned releases, there is not sufficient data to evaluate the effect of artificial recharge on the release.
5	Section 2.3 Page(s) 2-9..10 Lines 35-42/1-27 **Comment:** The cited AAMS paragraphs discuss the soil column pore volume calculations as used to estimate the relative level of concern at each disposal site. Non-polar organic compounds will generally exhibit much smaller specific retention than water, due to lack of capillarity. Therefore, compounds such as carbon tetrachloride may migrate more readily to groundwater than is suggested by the pore volume calculation. **Recommendation:** Qualify the validity of the pore volume calculation as applied to organic chemicals.	Reject. The specific retention estimate has been selected conservatively enough to account for this. The screening does not attempt to account for DNAPLs, moreover, and the aqueous solutions which are generally discharged are not noticeably different from water in their behavior.

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3	Section 2.2.4 Page(s) 2-5 Lines 27..29 **Deficiency:** Reference to the "sealed canyon...entombed in the building" is unclear. **Recommendation:** Define the "sealed canyon," or otherwise clarify the sentence.	Accept. Sentence will be clarified.

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6	Section 2.3 Page 2-10 First paragraph, lines 9 and 10 **Comment:** It is stated that based on hydraulic conductivity of Hanford soils, the transit time is too long for contaminants to have reached the groundwater via unsaturated flow. It is also stated that the "hydraulic conductivity of Hanford soils in the vadose zone is very low (Section 3.5.2.1.3),". The referenced section gives a saturated hydraulic conductivity range of .02 ft to 160 ft/day (page 3-48, lines 24 and 25). This hydraulic conductivity would not be considered "very low". **Recommendation:** Describe how transit time for unsaturated soil was determined, and the assumptions that were used. Also discuss how the transit times vary with the type of contaminant. What would be considered low for a hydraulic conductivity?	Accept. Unsaturated will be added to sentence to clarify that unsaturated hydraulic conductivity is very low. Section 3.5.2.1.3 describes how unsaturated conductivity can be determined and has several unsaturated hydraulic conductivity curves for Hanford units.
7	Section 2.3 Second paragraph on page 2-11 **Deficiency:** While section 2.3 describes the waste management units and unplanned releases, and Section 2.4 describes the waste generating processes, they do not relate how much and what type of contaminant determines the impact, i.e., a release of a large volume of water with a small concentration of constituents may be determined to have a significant impact on groundwater, while a small volume of liquid with a high concentration of constituents would be determined as not having an impact on groundwater. **Recommendation:** Define the relationship between the quantity of contaminants discharged and the risks from the radionuclides discharged.	Reject. We do not believe that risk issues should be introduced at this point, but rather in Sections 4 and 5 as the report is presently constructed. The purpose of this screening is only to select those waste management units with evidence that they may have impacted groundwater.

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8	Section 2.3 Last paragraph on page 2-10, lines 1-3 on page 2-14 **Deficiency:** There is a poor correlation between the gross gamma logs and the quantity of reported radionuclides disposed of in each waste management unit. The paragraph on page 2-14 states that gross gamma logs do not provide evidence that contaminants have reached the ground water at 216-U-14 ditch or 216-U-10 pond. However, there is mounding at U-pond and nearby wells indicate contamination moving from that area. **Recommendation:** Place less emphasis on negative elevated gross gamma levels. Evaluate effectiveness and document the existing gamma screening program. As stated on page 2-11, the geophysical logs serve better as positive proof of contaminant migration and failure to detect elevated gross gamma levels in monitoring wells does not disprove downward contaminant migration.	Accept. The use of gross gamma logs for evaluating impact on groundwater is well qualified in the text. The headings in Tables 2-3 and 2-4 will be changed in order to place less emphasis on negative elevated gross gamma levels. The heading on Table 2-3 will be changed to "Confirms Release to Groundwater" and on Table 2-4 to "Confirmed by Geophysical Logs".

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9	Section 2.3 Page 2-10 Paragraph beginning on line 13 **Comment:** We realize that this is, among other things, a scoping document, and several broad assumptions must be made to limit the areas in which to expend scarce resources. However, we find that the selection process for defining sites with "potential for migration of liquid discharges to the unconfined aquifer" listed in Table 2-2 apparently leaves some important contamination sites out of the investigation phase that will follow this report. This problem centers around the arbitrary criteria established to select sites that will be the subject of further evaluation. One criteria is that no site is considered to have an effect on groundwater flow unless there is a history of at least 100,000 square ft. of waste effluent dumped there. The criteria ignores the total cumulative impact of the numerous lower volume waste sites and there is no justification in this report for the selection of this amount for limiting criteria. An example of how this criteria will effect future investigation is crib 216-Z-7. This crib is shown in Table 2-1 as having received 79,000 m^3 of laboratory wastes (page 2T-1f). Table 2-2 lists "No" as an answer to "Significant impact on groundwater flow?" (Page 2T-2b). The crib is also shown on Table 2-3 as having an elevated Gamma log response indicating contamination as deep as 100 meters below land surface (page 2T-3a). The water table is at about 60 meters below land surface at that location (Hydrogeologic model supporting document, figure 3-2). It can be concluded that contamination from the crib or some other as yet	Reject. 100,000 m^3 is justified in text as being one or two orders of magnitude greater than the soil column pore space and would have potentially significant impact on groundwater flow. The term "significant impact" suggests change of flow. The 216-Z-7 Crib is below this cut off. Elevated gamma readings to 100 m beneath 216-Z-7 Crib may be due to radionuclides traveling down a poorly sealed well casing. Other wells do not go as deep but do suggest the 216-Z-7 Crib caused groundwater contamination.

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	this crib may have had an effect or at least may have contributed to an effect on groundwater flow causing contaminants to move to such a depth below the water table. The discharge from this crib may not in itself had had a significant influence on the flow system in the 200 West Area, however, along with many other similar waste units it may have contributed to a significant cumulative impact. Any impact at all is overlooked in the case of the 100,000 m^3 numerical criteria. The Gamma log "hit" to about 40 m below the water table also points out that contaminants have moved considerably deeper below the water table than is considered later in this document as the thickness of the waste plumes (10 m).	
10	Section 2.3.1.1 Page(s) 2-11..12 Lines 40-42/1-3 **Comment:** The soil column pore volume calculation is not applied to tank leaks because the area of the leak cannot be determined. **Recommendation:** An arbitrarily small area should be used in the calculation for comparison with other disposal units. An area equivalent to that used for the reverse wells would probably be appropriate.	Reject. Using an arbitrarily small area would add an additional assumption that may be misleading in evaluating the unplanned releases. The investigation associated with the T106 tank which had one of the largest tank leaks indicated that breakthrough did not occur.
11	Section 2.3.4.1 Page(s) 2-26 Lines 31-33 **Comment and Recommendation:** Same as Comment on Section 9.2.4.2, first paragraph on page 9-16 below.	Reject. Cannot correlate apparent reference to Comment 194 to text at this location. See comment 194.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
12	Section 2.5 Last paragraph on page 2-43 **Deficiency:** The 200 West groundwater AAMS area should contain the whole plume originating from facilities in the 200 West area. **Recommendation:** Enlarge study area to cover whole plume. If 200 West and 200 East or North plumes overlap, then define boundary and justify in text.	Accept. The 200 West Groundwater AAMS covers entire area of plumes emanating from the 200 West Area, except when they cross over into the 200 East Area. In such instances, the 200 East Groundwater AAMS addresses the entire plume (e.g., tritium). Study area cannot be delineated at this point of report because extent of plumes has not been presented.
13	Section 2.5 Page(s) 2-44 Lines 10-33 **Comment:** The two paragraphs cited discuss potential hydrologic interactions between the 200 West and the 200 East and 100 Areas. In the first paragraph, hydraulic effects of containment remedial alternatives are estimated to probably be minor. The second paragraph, discussing northward groundwater flow through Gable Gap, indicates a very uncertain, long-term, and limited possibility of significant interaction between the 200 and 100 areas. If a 402-foot contour is sketched in on Figure 3-78, it is apparent that a potentially large portion of groundwater flow from both the 200 West and 200 East Areas is northward through Gable Gap under present conditions. **Recommendation:** Expand this discussion to address large scale hydraulic interactions between the 200 West and other Areas, under both existing conditions and intentionally induced hydraulic gradients.	Reject. Expansion of potential hydrologic interactions beyond what is presented in the Draft A report would be too speculative given available information.

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14	Section 2.6 Page(s) 2-46 Lines 22-35 **Comment:** LLWMA 4 is identified as a RCRA groundwater monitoring project that may be encompassed in the 200 West Groundwater Aggregate Area; however, the aggregate area boundaries shown on Fig. 1-4 and Plate I exclude LLWMA 4. As discussed in Comment 19, a multi-contaminant plume encompasses this disposal unit, and it should probably be included in the groundwater aggregate area. **Recommendation:** Include LLWMA 4 in the 200 West Groundwater Aggregate Area, revising the boundaries as appropriate.	Reject. Figure 1-4 and Plate 1 show source aggregate areas only. LLWMA 4 is in the 200 West Area (see Figure 2-3) and is thus encompassed by the 200 West Groundwater Aggregate Area.
15	Section 2.7.2 Page(s) 2-48 Line 35 **Deficiency:** Reference to section 7.3.3 is invalid (no such section). **Recommendation:** Correct reference.	Accept. Reference will be changed to 7.4.3.
16	Section 2.8 **Comment:** The description of the present groundwater monitoring activities and groundwater monitoring networks could be improved. At present it is not clearly stated why there are so many different networks operating nor what the specific purpose of each is. The disjointed nature of these various networks without clearly defined objectives leaves the reader wondering why so many networks exist and how anyone could evaluate the effectiveness of the entire groundwater monitoring program. **Recommendation:** Include a figure or tabular listing that correlates the various monitoring networks with their associated wells.	Accept. A table will be added to correlate the various monitoring programs.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
17	Section 2.8.1 Third paragraph on page 2-53 and Table 2-8 **Deficiency:** There are several discrepancies between the screened intervals listed for several wells on Table 2-8 and the same wells listed on Table 2-16. For example: Table 2-8 Screen Interval / Table 2-16 Screen Interval Well No. 299-W19-17 230-255 / 230-355 299-W19-16 225-175 / 225-275 299-W22-220-210 255-300 299-W18-7 190-288 / 190-298 299-W15-6 0-350 / 175-408 299-W23-7 0-210 / 180-300 299-W23-2 184-225 / 150-260 299-W23-4 180-300 / 184-265 299-W22-10 203-311 / 195-305 299-W22-1 190-280 / 221-290 299-W23-9 164-230 / 165-230 299-W23-10 165-230 / 164-230 299-W11-24 200-250 / 210-250 299-W11-7 0-265 / 245-290 299-W14-10 260-275 / 195-230 299-W7-6 209-220 / 209-229 299-W9-1 266-296 / 266-286 299-W18-22 416-417 / 416-447 299-W6-2 224-225 / 224-244 299-W11-24 200-250 / 200-210 299-W19-1 320-370 / 178-299 299-W23-4 180-300 / 184-265 299-W23-7 170-248 / 180-300 299-W23-2 184-234 / 150-260 299-W23-8 165-230 / 170-248	Accept. Screen intervals as well as other well data will be checked for correctness. All tables will be updated to show these changes.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
	Not all wells were listed on both tables, so it is unknown how many other wells' screen intervals may be in disagreement. **Recommendation:** List correct screen interval on both tables. Check screen intervals for wells not on both lists.	
18	Section 2.8.2.1 Page(s) 2-55 1st and 4th paragraphs **Comment:** Lines 6-8 in the first paragraph of this section state that moisture transport studies indicate any leachate generated at the Low Level Waste Management Areas (LLWMAs) has probably not reached groundwater yet. However, lines 40-41 in the fourth paragraph indicate detection of 8 constituents above background levels in LLWMA 4. **Recommendation:** Clarify whether leachate from LLWMA 4 is the suspected source of groundwater contamination in that disposal unit. If the moisture transport studies have given an invalid indication of groundwater contamination risk, state this explicitly here and in section 2.3 (see Comment 6).	Accept. Text will be revised to clarify conclusion that elevated levels of TOX and TOC observed here are associated with the carbon tetrachloride plume known to be present in this area.
19	Figures 2-4 through 2-10 **Deficiency:** No groundwater gradient direction on figure to assist in evaluating whether wells are properly located. **Recommendation:** Place groundwater gradient direction arrow on figures.	Accept. Upgradient wells will be differentiated on these figures to indicate general groundwater flow direction.
20	Figures 2-11 (WHC) and 2-12 **Deficiency:** Locations of some wells are not the same on both map figures, notably 699-3570, 299-W12-1, 299-W10-5, 297-W18-3, and 299-W22-9. **Recommendation:** Place correct locations on figures.	Accept. Figures will be updated to show proper well locations.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
21	Table 2-2 **Comment:** A number of assumptions are made in developing Table 2-2. These are: • Assumed soil porosity(s) • Assumed groundwater depth of 164 feet • Soil acts as a homogenous column (homogenous permeability of soil) • One-dimensional flow (no lateral flow) • Liquid effluent volume accurate • Area for infiltration equal to the dimension of the base of crib, trench, tile field, drain, or well Based on these assumptions, the estimated soil column pore volume range (Column 3) and the indication of possible migration to groundwater (Column 4) were determined. These estimates are very conservative and should only be used for providing a relative indication of potential impacts (indeed, this is stated in the text). **Recommendation:** That the wording in Column 5 be changed to "relative potential impact on groundwater flow." Furthermore, a ranking of the relative potential impact of the various discharge sources is recommended. Such a ranking could be used for determining cleanup priorities.	Reject. Ranking of units would be pushing the screening beyond its capability or usefulness.
22	Table 2-2 **Comment:** In Column 5, are you concerned with impact on groundwater flow or groundwater quality? **Recommendation:** Modify column 5 heading in Table 2-2.	Reject. The table clearly indicates that column 5 concerns groundwater flow.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
23	Table 2-2 **Deficiency:** Since ditches 216-U-14, 216-U-1D, 216-2-11, and 216-Z-19 transferred 165,005,000 cubic meters of liquid effluent to the 216-U-10 pond, the volume of water received by the soil would be very high, indicating possible migration to uppermost possible aquifer, and significant impact on groundwater flow. To say no migration or significant impact would occur is not conservative. **Recommendation:** When the effluent amount is undetermined, possible migration to aquifer and a significant impact should be assumed.	Accept. Will change 216-U-14, 216-Z-11, and 216-Z-19 to "Yes" with a footnote indicating that even though the volume for each ditch was not determined, the volume was probably great enough to receive a yes.
24	Section 3.3.2 Paragraph on top of page 3-5, lines 3-5 **Comment:** This sentence reads like the Snake and Walla Walla rivers are tributaries to the Columbia and Yakima rivers. **Recommendation:** Rewrite this sentence to reflect that the Yakima, Walla Walla and Snake rivers are tributaries to the Columbia River.	Accept. Text will be clarified to identify that the Snake and Walla Walla Rivers are tributaries of the Columbia River.
25	Section 3.4.1.3 line 38 on page 3-9 **Comment:** "Western Washington" should be Eastern Washington. **Recommendation:** Please make the appropriate change.	Accept. Text will be corrected to reference eastern Washington.
26	Section 3.4.1.3 Paragraph on top of page 3-10 **Comment:** Two earthquakes occurred near Walla Walla, the first a magnitude 4 on November 27, 1991 and the second a magnitude 3 on December 15, 1991. **Recommendation:** Include reference to these earthquakes in the text.	Accept. The recent earthquake information will be added.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
27	Section 3.4.2.1.1 Page(s) 3-13..14 Lines 42/1-5 **Deficiency:** The sentence beginning on line 42 of page 3-13 is unclear. If the drilling referenced in DOE (1986 and 1988) has already been conducted, what was the result? **Recommendation:** Resolve the above confusion.	Accept. Text will be revised to indicate that the referenced drilling and geophysical data were insufficient to determine the nature of the stratigraphic condition cited.
28	Section 3.4.4.1, page 3-27, line 33-34 **Deficiency:** The short discussion here, and elsewhere in this document, point out the lack of data concerning water quality, stratigraphy, hydraulic characteristics, and water levels in confined aquifers (including the Columbia River Basalt Group) in the area. **Recommendation:** More data are needed.	Accept. Data gaps related to hydraulic properties, stratigraphy, and water quality (e.g. chemical contamination) data are discussed in Section 8.0. A general comment describing data gaps related to stratigraphic, hydraulic characteristics for deeper aquifers (and referencing Section 8.0 will be added to Chapter 3.0).
29	Section 3.5.1.1, page 3-31, line 38 **Comment:** The reference to Section 3.4.2.1 probably should be 3.4.2, the general heading section about stratigraphy.	Accept. Text section reference will be revised to Section 3.4.2.1.2.
30	Section 3.5.1.1, page 3-32, line 36 **Comment:** The reference to Section 3.4.2.1.1 probably should be 3.4.2.1.2, the section describing intraflow structures.	Accept. Text section reference will be revised to Section 3.4.2.1.2.
31	Section 3.5.1.1., page 3-33, line 8 **Comment:** The reference should be 3.4.2.1.2	Accept. Text section reference will be revised to Section 3.4.2.1.2.
32	Section 3.5.1.2, page 3-34, paragraph beginning line 30 **Comment:** In testing wells to determine aquifer properties, another complicating factor can be storage of water in the well bore. This should be mentioned in this paragraph which already clearly states the other factors involved.	Accept. Well bore storage will be added as a factor influencing aquifer test results.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
33	Section 3.5.1.2, page 3-34, line 17-18 **Comment:** The ranges of values for hydraulic conductivity and transmissivity for the Hanford Formation are inconsistent with the values presented in Tables 3-1, 3-2, A-7, and A-8. If the range is based on some other data set it should be so stated, if not the minimum and maximum should be reflected in the data presented in this report.	Accept. Tables will be checked for consistency and Table 3-1 (and applicable text) revised where appropriate. Tables A-7 and A-8 reflect published WHC data; Table A-7 (Newcomer et al. 1992) represents the original data source from which data in Table A-8 were derived (in part). Table A-7 will, therefore, be used where discrepancies with Table A-8 exist. Note: The comment appears to reference Table 3-1 and Table 3-2 from the pre-decisional draft version of the 200 West Groundwater AAMSR. The "old" version of Table 3-1 is now incorporated in the Draft A report as Table A-7. Table 3-2 now deals with endangered/threatened species and does not list hydraulic data.
34	Section 3.5.1.5.1, page 3-37, line 23 **Comment:** The amount of "natural groundwater recharge" listed here (130,000 L/yr) is inconsistent with the value listed on page 3-51, line 6 (130,000,000 L/yr).	Reject. The value on page 3-37 is from Gee 1987; the value listed on page 3-51 is an estimate based on 0.1 cm/yr precipitation recharge. However, the value on page 3-51 will be changed to 8,300,000 L/yr.
35	Section 3.5.2.1.2, page 3-43,lines 15 and 18 **Comment:** Two separate errors here, line 15 reference to Figure 3-49 probably should be referring to 33-55 and line 18 listing saturated thickness of "67 to 112" is inconsistent with Figure 3-52. A range consistent with the figure would be "40 to 80."	Accept. Figure 3-49 reference will be corrected to Figure 3-55: depth to the water table (uppermost portion of the unconfined aquifer). The saturated thickness range for the uppermost aquifer will be corrected to 40 to 80 m, as depicted on Figure 3-52.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
36	Sections 3.5.1.2 and 3.5.2.1.3 Page(s) 3-35 and 3-48 **Deficiency:** Page 3-35, lines 16-17 state that hydraulic conductivities for the Hanford Formation vary from 1.8×10^{-3} to 0.7 m/s. Page 3-48, lines 24-25, indicates hydraulic conductivities in the Hanford Formation between 7×10^{-8} and 5.5×10^{-4} m/s. **Recommendation:** Resolve the above contradiction.	Reject. Hanford formation hydraulic conductivities in Section 3.5.1.2 are results from uppermost unconfined aquifer testing. Hanford formation hydraulic conductivities in Section 3.5.2.1.3 are vadose zone values at saturation, and, therefore, are expected to differ from the unconfined aquifer values. The range of saturated vadose zone conductivities for the Hanford formation (site-wide) will be corrected, however, to include the 0.02 to 160 ft/day range reported for vadose zone samples of the Hanford formation in the 200 West Area.
37	Section 3.5.1.5.1 Second paragraph on page 3-38 **Comment:** Is the soil with high moisture content indicating local saturation with natural groundwater, or with contaminated water? Since this section is titled Natural Groundwater Recharge, it should not be contaminated but it does appear to be an anomaly. **Recommendation:** State if water is natural groundwater or is contaminated.	Accept. Referenced vadose zone moisture contents will be checked. Additional text will be added to clarify if suspected moisture source is leaky tanks, resulting in contaminated water/fluid in the vadose zone.
38	Section 3.5.2.1.2 First complete paragraph on page 3-44 **Comment:** Table 3-1 is referenced, however this table does not appear in the back of Section 3. Where is this table located? **Recommendation:** Please include this table in the document.	Accept. Table 3-1 is included in the current document. Additional references to Table 3-1 as a summary table derived from detailed information on Tables A-7 and A-8 will be provided.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
39	Section 3.5.2.1.3 pages 3-44 through 3-48 and Figure 3-56 through 3-65 **General Comments:** This section discusses unsaturated conductivity and unsaturated flow. In addition, conductivity curves for various Hanford soils are presented. It is never clear how this data is going to be used.	Accept. A statement will be added to indicate that vadose zone hydraulic properties are an important factor when considering vadose zone liquid transport and recharge.
40	Section 3.5.2.1.4 First paragraph on page 3-50 **Deficiency:** Crib 216-Z-20 is discussed as being part of the Z Plant Aggregate Area. It is also discussed in the Z Plant Section 2.3.2.7, in U Plant Section 2.3.1.2, and in Table 2-1 under the U Plant Aggregate area. It is unclear which Aggregate area includes Crib 216-Z-20. **Recommendation:** Clarify in which Aggregate Area Crib 216-Z-20 will be included.	Accept. A statement will be added to identify the 216-Z-20 Crib as a U Plant Aggregate Area waste management unit. However, the Z Plant and U Plant source area AAMSRs recommend addressing the crib as a Z Plant Aggregate Area waste management unit.
41	Section 3.5.2.2.1 lines 1-9 on page 3-51 **Comment:** Why is 0.10 cm/yr considered more conservative than 10 cm/yr when considering natural recharge to the 200 West Area? It would appear that the more conservative estimate would be the higher recharge rate that would tend to mobilize contamination within the soils of 200 West, especially if there is very little vegetation and the soils tend toward the coarser fractions (underlying the finer eolian sands). **Recommendation:** Answer the above question.	Accept. Paragraph will be reworded to clarify that 0.10 cm/yr is the appropriate number to use for natural recharge. The word conservative will be deleted.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
42	Section 3.5.2.2.1, page 3-51, line 6 **Deficiency:** "Natural recharge" is either 130,000 L/yr or 130,000,000 L/yr. **Recommendation:** Make the text consistent.	Accept. The natural recharge should be 8,300,000 L/yr. See Comment 34.
43	Section 3.5.2.2.2 Third paragraph on page 3-51 **Comment:** Why is the 216-U-14 ditch currently receiving water from a hydrant? **Recommendation:** Answer the above question.	Accept. The 216-U-14 Ditch no longer receives water from a hydrant so this statement will be deleted from the text. Water was added to the ditch from the hydrant up to March 1992 to control dust.
44	Section 3.5.2.2.2, page 3-51, paragraph beginning on line 28 **Deficiency:** The per day value (12,120) does not match the historic total value (166 billion). 12,120 L/day for 1944 to 1992 is 212 million. **Recommendation:** Explain the calculation in more detail or correct the error.	Accept. Paragraph will be altered to clarify that the total volume received by the drain fields is estimated to be 256.6 million liters.
45	Section 3.5.2.3.1, page 3-56, paragraph beginning on line 1 **Comment:** Rather than only giving the quotient of the vertical gradient, please give the head difference and the vertical separation of the screened intervals.	Accept. Head difference and vertical separation of screens will be added to text on page 3-56.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
46	Section 3.5.2.3.1, page 3-56, lines 16-18 **Deficiency:** "The thickness ... and ... low hydraulic conductivity" of the Lower Mud Unit is "sufficient to preclude a significant amount of recharge" is a rather broad statement concerning downward movement of groundwater and contamination. Although the hydraulic conductivity is low and the gradient is unknown (but probably low) the area is large (several square miles). Since the flux is the product of the gradient, the conductivity, and the area, a large area may mean significant flux. **Recommendation:** It would be better to state that the Lower Mud will limit downward recharge rather than "preclude" downward recharge. At this time are there water quality data from wells screened in the Ringold Unit A to support this statement that no downward movement (contamination?) has occurred?	Accept. Wording will be changed to indicate that Lower Mud limits downward recharge.
47	Section 3.5.2.3.1 line 17 on page 3-56 **Comment:** 2×10^{10} m/s should probably be 2×10^{-10} m/s. **Recommendation:** Please make the editorial change.	Accept. 2×10^{10} m/s will be changed to 2×10^{-10} m/s.
48	Section 3.5.2.3.2, page 3-57, lines 41-42 **Comment:** Hydraulic properties are not discussed in Section 3.5.2.1.4, Section 3.5.1.1 does.	Accept. Reference will be changed.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
49	Section 3.5.2.3.2, page 3-58, lines 24-25 **Comment:** Throughout this report it is stated that the groundwater system is changing. Water levels and volumes of waste were going up from the 1940s to the 1980s, now they are going down due to operational changes. In the discussion about the degree of connection between the unconfined and the confined aquifers a report (Ledgerwood and Deju, 1976) is cited to support the lack of interaction. If the system is changing, the Ledgerwood and Deju (1976) report is probably out of date. If so, this points out that more current data is needed to make decisions concerning contaminant transport. This is a significant gap in the available data and, as such, is appropriately identified in Section 8.2.3. Specific recommendations should appear in Section 9.0 detailing what data to collect.	Accept. More current data is needed regarding groundwater properties, although more because of improvements in methodology than because the groundwater system has physically changed very much. Addressing this data gap is discussed in Section 8.3.3.2. No change required to AAMSR.
50	Section 3.7.2 Last paragraph on page 3-64 **Deficiency:** The future land use of the Hanford site is under discussion; to state that, "the entire Hanford site is administratively controlled and is expected to remain this way," is premature. **Recommendation:** Remove paragraph.	Accept. Referenced sentence will be removed.
51	Section 3.7.3, page 3-66, line 4-5 **Deficiency:** It is stated that there is water used from the basalt and interbeds "upgradient", but in general little is known about groundwater in the confined system underlying the 200 West Area. **Recommendation:** More information is needed about these important units.	Accept. Additional hydrogeologic information from the confined aquifers in the 200 West Area has been identified as a data gap issue in Chapter 9.0. No changes to text.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
52	Section 3.7.3, page 3-66, line 8 **Comment:** The phrase "may also be used to supply drinking water" is of concern. We assume someone is monitoring the water use in an area where contamination of the groundwater is so common and suggest that more specific data be presented in this report.	Accept. Typo will be corrected: possible drinking water supply wells refer to Chateau St. Michelle No. 1 and No. 2, not the emergency 200 East Area wells.
53	Section 3.0, Figures 3-25 to 3-43 **Comment:** A single map scale, a single scale of units for contouring (metric or English, Figure 42 is the only metric of all these figures), and a consistent orientation (North up?) would help the reader to compare these figures to each other. Since these figures appear to be digitally encoded products, this should be easily done. Figure 3-29 has no contour interval in the explanation.	Accept. Figures will be made consistent (i.e., Figure 3-42 will be made consistent with the other figures).

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
54	Section 3.0, Figures 3-25 to 3-41 **Deficiency:** Summing thicknesses downward and subtracting that from the land surface altitude appears to be the method used to determine the top of all units. We believe that this introduced errors in these figures. An example of this occurs as a series of "Bull's eye" contours in Figures 3-31, 33, 35, 37, and 39. These feature occur in the northwest corner of the 200 West Area and as shown in Figure 3-31 center on the closed 600-foot contour. If the sequence of figures is followed up through the stratigraphic column, it is apparent that the closed contours occur in all maps. The telling aspect of this error is that there is a small hill in that area (at land surface) and no wells to confirm a "hill" in the underlying geology. Additionally, the "Bull's eye" on Figures 3-28, -29, -30 near the center of the figure appears to be the result of an uncertainty in what is the bottom of the Lower Mud. The geologic sections that include this well (299-W18-21?) indicate that no pick was made on the bottom of the unit, therefore, the "Bull's eye" does not represent an actual thickness or tops or thicknesses of lower units. Similar errors are found in figures in the supporting document concerning the Hydrogeologic Model. We understand that the geology is relatively unknown in these areas and that the contouring program probably produced these artifacts. Our primary concern is that this data set will be used in the future to construct a digital simulation model of the groundwater flow. In this case, seemingly harmless machine artifacts	Reject. Isopach and structure contour maps can be constructed either by hand or generated with geologic contouring software on a computer. For this report, we determined that the production and use of computer generated maps were advantageous for a number of reasons: 1) The computer capable of handling interpolating large datasets (ie, large number of wells) 2) Ease in changing or modifying the contour interval 3) Ability to examine the dataset in three-dimensional aspects. 4) Ability to rapidly update the maps as new data become available 5) Vertical consistency between different layers 6) Speed It was felt that these advantages outweighed disadvantages associated with the potential for inaccurate interpolation in "data-poor" areas or the presence of minor computer artifacts. The disadvantages to computer contouring were overcome by adding appropriate control points based on professional judgement. For these maps we created isopach maps of each of the formations with the appropriate control points and then subtracted the isopach map of each unit from the bottom of the overlying unit starting at land surface. The bull's-eye the reviewer is referring to is caused by the ridge at land surface and is not an artifact of computer contouring. The bull's-eye shows what happens as the density of data points used in the contouring changes for each formation. If all of the available data are used, additional highs and lows will appear due to change in the number of

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
	Recommendation: We recommend that an experienced geologist examine these maps for computational artifacts that do not represent real physical features. Adding "data points" to the map based on best professional judgement could reduce the change for machine induced errors. In the case mentioned above, the lack of well control on the top, the Hanford Formation-Lower Fine Unit could be taken into account for Figure 3-39. Stratigraphically lower units would then not be subject to the error in thickness of these units above.	
55	Section 3.0, Figures 3-46 to 3-50 and 3-52 to 3-55 **Comment:** Again, a mixing of scales, orientation, and units will confuse the reader.	Accept (partial). Figures 3-46 through 3-50 are from various documents and can not be altered for consistency. Figures 3-52 through 3-55 will be made to use consistent units. Figures 3-53 and 3-54 are larger to show greater detail.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
56	Section 3.0, Figures 3-52 to 3-54 **Deficiency:** Several points in Figures 3-52, 3-53, and 3-54 were examined in detail. At one such point, at the approximate location of well 299-W18-22, Figure 3-52 shows an aquifer thickness of about 65 meters (about 210 feet), Figure 3-54 shows a hydraulic conductivity of about 1000 ft/d, and Figure 3-53 shows a transmissivity of about 50,000 square ft/d. The standard relationship of [transmissivity = hydraulic conductivity x saturated thickness] should yield a transmissivity of 210,000 square ft/d. In Table 3-1, data indicate two aquifer tests were made on well 299-W18-22. The calculated hydraulic conductivity values were 1.7 and 20 ft/d. Calculated transmissivity values for the same well are shown to be 400 and 420 square ft/d. **Recommendation:** These discrepancies should be resolved and/or an explanation should be given to keep the reader informed of how these figures, tables, text, and theory fit together.	Accept. Well 2-W18-22 results of test data were not included in the transmissivity contouring. The well number was inadvertently left on map. The data (51,000 ft^2/day) is associated with well 2-W18-21. The transmissivity map figure will be corrected.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
57	Section 3.0, Figures 3-66 to 3-72 and 3-78 **Comment:** Mixing scales and orientation should be avoided if possible. Also, there is no consistency between these figures in the area of "Estimated basalt outcrop above water table". Water levels change from one figure (and time) to another, but these changing areas are more likely due to the base map for a particular figure. A consistent base map or a further explanation of the changing areas would help the reader understand the point. On Figure 3-72, the source is listed as Kipp and Mudd (1974). It is likely that the base is from Kipp and Mudd and the 1987 water levels are from ..... (fill in reference)?	Reject. If Figure is from another document, it will not be changed. Accept. Source reference will be added on Figure 3-72 as Evans, et al 1988.
58	Section 3.0, Figures 3-73 to 3-76 **Comment:** A bar graph showing estimating water disposal rates would be superior to the history of operation. Some processes must have generated more or less waste water than others, this information would help the reader to understand the fluctuations in the well hydrography.	Reject. Available information is insufficient to derive a detailed history of discharge from each waste management unit.
59	Section 3.0, Table 3-1 **Comment:** The relationship of transmissivity, hydraulic conductivity and thickness is unclear. An example is well 299-W15-16: an open interval of 10 feet, a transmissivity of 12,000 square ft/d, and in the remarks column a hydraulic conductivity of "52".	Accept. Table 3-1 in DOE/RL-92-16 Decisional Draft shows ranges of hydraulic properties values. It is unclear what table the reviewer is referring to. However, for well 299-W15-16, a constant discharge/recovery test was performed. This test resulted in a calculated transmissivity of 12,000 ft^2/day. To estimate the equivalent hydraulic conductivity, the transmissivity value was divided by the vertical length of the stressed portion of the aquifer (K=T/B). In this test, the stressed portion of the aquifer was 10 feet in length. Thus, the estimated hydraulic conductivity is 1,200 ft/day.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
60	Tables 3-1 through 3-3 **Comment:** Missing from report. **Recommendation:** Include Tables 3-1 through 3-3 in report.	Comment noted. Tables 3-1 through 3-3 are currently included in the report.
61	Section 3.0, Table 3-2 **Comment:** For the 200 West Area, this table lists a hydraulic conductivity (ft/d) range of "2,000-10,000". Table 3-1, which lists the data, indicates 10 values in the 200 West Area in the unconfined aquifer that range from >240 to 5,000. These tables should agree or an explanation should be presented.	Comment noted. Comment appears to be a reference to the pre-decisional draft version of the report. See Comment 33 re: checking of current Tables 3-2, A-7, and A-8 and resolution of discrepancies.
62	Section 4.0 Second paragraph on page 4-1 **Deficiency:** Two potentially affected media not addressed are atmosphere and biota. **Recommendation:** Include both as potential media.	Accept. "...and vegetation." will be replaced with: "...vegetation, atmosphere, and biota. Text will also be revised to stress that the Section 4 evaluation focuses on groundwater quality and that other affected media are discussed in source AAMs.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
63	Section 4.1 **Comment:** The title of this section suggests that there will be discussion of known contamination of groundwater (i.e., that documented by monitoring) and suspected or potential contamination. This section only covers that contamination identified by monitoring. There are discussions elsewhere in the document that indicate that there are essentially no waste disposal records from the early years of operation of most of the facilities (1940s through early 1950s?). Consequently, there would seem to be a significant potential for unknown contamination. This could involve both the types of contaminants and areas of disposal. The report includes little discussion, and none in this section, of the potential for occurrences of groundwater contamination outside of that identified to date by the existing monitoring programs. **Recommendation:** This issue should be addressed somewhere in the report. It is not discussed in Section 8, Data Quality Objectives, and is not mentioned as a data gap. There is discussion as a data gap of chemicals that are known to have been used on site that have not been detected in groundwater, but this is not the same issue. It would seem appropriate to define an approach to provide some level of assurance that there are not significant undocumented wastes and waste disposal sites within the 200 West Area.	Reject. It is unlikely for a significant unidentified source area to exist without reference in the historical record. Although there are gaps in the historical record, there is enough information to suggest that a substantial hypothetical unidentified source area does not exist. In addition, although well coverage may be sparse in some areas, if a large source area did exist, there would likely be some indication in the groundwater.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
64	Section 4.1.1.1, page 4-2, paragraph starting on line 31, Section 4.1.1.4, page 4-5, lines 13-15, and Section 4.1.1.5, page 4-5, lines 31-32 **Comment:** Since 10 meters is used as the thickness of all contaminant plumes it should be stated here whether any exceptions to that assumption occur. Five monitoring wells are finished in the Lower Ringold E, were there any contaminant "hits" in those wells? If so, we question the credibility of the assumption about thickness of the plumes.	Reject. The text emphasizes that the 10 meter depth for the vertical extent of contamination was selected to provide a preliminary estimate for the potential volume of chemical compounds in the groundwater. The test also indicates that further characterization of the vertical extent of chemical constituents will be needed to refine this estimate. Text will be modified on page 4-5, lines 34-41 to refer to "nominal" (rather than "assumed") plume thickness, consistent with previous investigations which used this "nominal" (not "arbitrary") depth for volume/area estimates. The credibility of the discussion is not being compromised because the nominal 10 meter depth is used only to provide a preliminary estimate.
65	Section 4.1.1.1, page 4-3, lines 8-10 **Comment:** Any talk of plugging this well or the annular space in the wellbore? We saw no mention in Section 9.0.	Accept. The text will be revised in Section 9 to include a general recommendation that the construction of this well and other suspect wells be further evaluated and the appropriateness for given purposes (e.g., monitoring, geophysical logging, etc.) be assessed. A recommendation will be made for appropriate action to be undertaken to mitigate the potential for wells with suspect seals to contaminate deeper water bearing zones.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
66	Section 4.1.1.6.4, page 4-11 **Comment:** Within this section the discussion of concentrations seems to be confusing at times. On line 12 concentrations "range from 45 to 1,265;" on line 13 the "maximum sample concentration" is 2,810 mg/l; on line 14 "maximum average" is 1,322 mg/l; and on line 18 "the highest concentration" is 1,265 mg/l. There should be a single maximum concentration and it should be what is listed as the upper end of the range. Also note that Sections 4.1.1.6.5, .6, .8, .9, .10, .11, .12, and .14 use the term "maximum average concentration" while Table 4.1 uses "Average of reported values" for the same number. Which is it or do you intend the reader to accept that they mean the same?	Accept. Revise the following sentence "Concentrations of nitrate ..." to the following: "Average concentrations of nitrate (as nitrate) within the plume range from 45 to 1,300 mg/L (Figure 4-4)." In addition, change "... (1,265 mg/L)" to "...(1,300 mg/L)". In Table 4.1, the "maximum average concentration" corresponds to the "Average of Reported Values" in Table 4.1, as discussed on page 4-3, lines 16-18. Table 4-1 will be revised to clarify this point.
67	Section 4.1.1.2 pages 4-3 and 4-4. **Comment:** The plume maps were developed by averaging detected concentration values at each well for chemical compounds and radionuclides and drawn with contours that reflect concentrations above some ground-water quality criteria. More information would be available for drawing the contours and delineating the plumes if the contours included data above detection levels where DLs are below the water quality criteria. This would mean that, for example, nitrate could be mapped down to levels around .5 ppm, rather than 45 ppm. Tritium contours would not stop at 20,000 pCi/l but could go down to approximately 500 pCi/l. Rather than single wells for some constituents, there could be more. **Recommendation:** Please examine the possibility of using contours down to lesser values to better delineate the various plumes.	Reject. Plume maps were generated to depict plume areas exceeding MCL regulatory thresholds. For the screening purposes of the AAMS reports, these regulatory criteria, rather than contours reflecting the detection limit, are appropriate.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
68	Section 4.1.1.2, pages 4-3 and 4-4 **Comment:** Average detected concentration values at each well are used to identify chemical compounds that exceeded groundwater quality criteria and to prepare groundwater contaminant plume maps. This approach provides neither a gross indication of the extent of contamination for each constituent nor sufficient data for contouring. A statistically estimated value based on 95 percent upper confidence limit (similar to the one proposed for soil and groundwater in the Washington State Department of Ecology guidance (Ecology 1992) or the maximum concentration of constituent should be compared to the groundwater quality criteria wherever applicable to select the contaminants of concern. Those contaminants with maximum concentrations greater than the maximum concentration level (MCL) and average concentrations less than the MCL should be considered for ERA or IRM. However, averaged concentration values or results from the most recent groundwater sampling round can be used to develop the groundwater isoconcentration contaminant plume maps.	Reject. See response to Comment 67. The averaging approach used does provide an better estimate of the groundwater contamination levels for the constituents of concern. This approach is consistent with previous WHC groundwater quality studies using time-averaged data as being more representative of actual conditions than single sampling round values or maximum values. Single round values or maximum may be susceptible to seasonal variations and other effects producing less representative results than averaged data.
69	Section 4.1.1.1, page 4-4, line 2 **Comment:** Contaminant plume maps were developed by averaging detected concentration values at each well and identifying these compounds that exceeded groundwater quality criteria. Since the detected concentration averaging may affect the determination of areal extent of contamination, the method of data averaging should be described.	Accept. The text will be modified to include this discussion.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
70	Section 4.1.1.1, page 4-4, lines 9-11 The areal plume distributions were based predominantly on sampling data collected from monitoring wells screened within the upper 20 feet of the unconfined aquifer. Site contaminants that exhibit densities greater than water that may not be detected by this sampling methodology should be identified. The vertical distribution of contaminants should be considered when estimating contaminated groundwater volumes and evaluating remedial alternatives such as pump and treatment.	Reject. Except for the carbon tetrachloride, where DNAPLs are anticipated, and a few high salt content waste streams, most contamination has been at concentrations which do not lead to density separation. Reject. Vertical distribution data are currently too limited to be used to produce volume estimates. See response to Comment 64.
71	Section 4.1.1.4, page 4-5, lines 5-8 **Comment:** The text states that in some cases the detection limit was above the lowest cleanup level, and the area of contamination was mapped based on the lowest concentration contour set slightly above the detection limit. The cases in which the detection limits were higher than the most stringent regulatory level should be identified.	Accept. Page 4-5, lines 5-8, the text will be clarified to identify compounds with detection limits above the most stringent regulatory level. Table 4-1 identifies the minimum reported detection limit for chemical compounds. This table will be revised to reflect those compounds where the detection limit exceeds the applicable regulatory level.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
72	Section 4.1.1.5, page 4-5, lines 29-35 **Comment:** The text states that some contamination of the lower portion of the unconfined aquifer has occurred. Selected deep and shallow sample results are presented in Table 4-2, (e.g. for nitrate and carbon tetrachloride). However, a nominal value of 10 meters (33 feet) was assumed as the vertical extent of contamination in all of the 14 groundwater plumes identified. Changes to the assumed vertical extent of groundwater contamination greatly impacts the volume of contaminated groundwater, required treatment rates and estimated cleanup times. The rationale for assuming this vertical extent, rather than providing a reference, should be provided for contaminants that have been detected at deeper sampling locations.	Accept. Rationale for the 10 meter nominal thickness is provided in the text in Sections 4.1.1.4 and 4.1.1.5. This rationale does not negate the validity of the conclusion cited from Eddy et al. (1978). See response to Comment 64. Vertical extent will be addressed in subsequent work plans
73	Section 4.1.1.5 page 4-5, line 29 and line 32. **Deficiency:** The reference to Eddy et al. (1976) should be to Eddy et al. (1978). ^{106}Rb should probably be ^{106}Ru. **Recommendation:** Please make the appropriate changes.	Accept. Text will be revised to reflect Eddy et al. (1978)
74	Section 4.1.1.5 page 4-7, lines 23-25. **Deficiency:** The end of this sentence requires clarification. What is "the two thirds' relative immiscibility?" **Recommendation:** Please explain what "two thirds' relative immiscibility" means.	Accept. Revise following text "... and the two thirds' relative immiscibility." to the following: "... and its relatively immiscible behavior."
75	Section 4.1.1.6.1, page 4-7, line 40 **Comment:** The acronym WWQC is not defined and a definition should be provided.	Accept. The acronym WWQC will be defined.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
76	Section 4.1.1.6.2 page 4-9, lines 29-30. **Deficiency:** There is no evidence, to our knowledge, that Cr(VI) "would be expected to complex with organic carbon, however, decreasing its overall dissolved concentration." However, it is well documented that Cr(III) will form complexes with organics in the environment. Perhaps the authors just confused the two distinctly different forms of chrome. As far as specific chemical data is concerned, since hexavalent chromium is the more mobile of the species, it may conservatively be assumed that the total chromium found in ground water would be primarily Cr(VI). This may or may not be a data gap for ground water. **Recommendation:** Either provide evidence that this is a common complex for Cr(VI) or delete the statement. Evaluate whether specific chemical data is necessary for ground water samples containing undifferentiated chromium.	Accept. The sentence on page 4-9, lines 28-30 will be deleted. The following sentence on page 4-9, lines 30-32 will be retained to identify the data gap.
77	Section 4.1.1.6.2, page 4-9, lines 34 through 42 **Comment:** The text references table 4-2 for chromium concentrations in deep wells 299-W15-17 and 299-W18-22. Results of sample analyses are not presented for either of these wells in the table. This discrepancy should be addressed.	Accept. Additional pages with these wells were inadvertently omitted from Table 4-2. Table 4-2 will be revised.
78	Section 4.1.1.6.5 Page(s) 4-13 Line 6 **Deficiency:** A word is missing after "located." **Recommendation:** Insert appropriate word.	Accept. Page 4-13, line 6 will be revised from "Plume center C is located and west of the ..." to "Plume center C is located west of the ..."

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
79	Section 4.1.1.6.7 Page 4-16 Line 3 **Deficiency:** m^3 should be m^2. **Recommendation:** Insert appropriate number.	Accept. Page 4-16, line 3 will be revised from "... 2,200,000 m^3 ..." to "... 2,200,000 m^2 ..."
80	Section 4.1.1.6.9 page 4-18, lines 13-16. **Deficiency:** The list of beta decay radionuclides to which "gross beta levels can commonly be attributed" in groundwater is incomplete. **Recommendation:** If there is a reason why the list is incomplete, please state so. Otherwise complete the list including, for example, tritium which is by far the largest source of beta decay radioactivity in the groundwater.	Accept. List will be checked but is not intended to be a complete listing of beta emitters. In particular, tritium though a beta emitter usually does not show up in gross beta because of standard analytical procedures which do not detect it.
81	Section 4.1.1.6.9 page 4-18. **Deficiency:** The gross beta minimum contour is based on the 50 pCi/l water standard for gross beta. However, if ^{90}Sr is the contributor to the gross beta activity the standard is 8 pCi/l, and the activity has to be specifically differentiated to this more restrictive DWS. The minimum contour of the gross beta plume should be 8 pCi/l. **Recommendation:** Please reevaluate the gross beta plume using the lower 8 pCi/l as your bottom contour.	Reject. The MCL for gross beta activity has been utilized rather than an MCL for any individual constituent. ^{90}Sr is assessed separately and is accounted for that way. The 50 pCi/L is a drinking water standard and is appropriate for drawing the gross beta plume map. However, the map as drawn will not directly impact remediation since gross beta is an indicator parameter rather than a contaminant which can be remediated.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
82	Section 4.1.1.6.10 page 4-19 to 4-21. **Deficiency:** The tritium units have been converted to nCi/l to apparently accommodate the contour plume map on Figure 4-10. The pCi/l units should probably be retained to be consistent with the Hanford sitewide plume maps and with reported data. **Recommendation:** Please keep the units consistent, pCi/l units for radionuclides should be used throughout the text and in Figure 4-10.	Reject. The conversion to nCi/l was necessary to make the figure legible.
83	Section 4.1.1.6.11 page 4-22, lines 8-14. **Deficiency:** The ^{99}Tc levels shown in Figure 4-11 are generally higher than the gross beta values in Figure 4-9. Since ^{99}Tc is only a portion of the total beta decay emitters in the groundwater, why isn't the gross beta activity greater than the ^{99}Tc activity? **Recommendation:** Please explain this discrepancy.	Accept. The differences you have noted are due to different methodologies used to detect these radionuclides. Text will be added to Section 4.1.1.6.11 to clarify. The discrepancy is probably due to the use of a standard method of counting gross beta which was developed for more energetic beta emitters (e.g., ^{90}Sr) and for less volatile ones, and is not as accurate for ^{99}Tc.
84	Section 4.1.1.6.12 Page 4-23 Line 1 **Deficiency:** The statement that no data are available on the vertical distribution of ^{129}I is incorrect. Refer to Comment on Section 9.4.1, page 9-28.	Accept. No correlation can be seen between this issue and apparent reference to Comment 197. However, text will be revised to indicate that only very limited data exist to assess the vertical extent of iodine-129 in the 200 West Area and that sampling data for wells listed on Table 4-2 do not include iodine-129. The vertical extent of contaminations is will be noted as a data gap.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
85	Section 4.1.1.6.13 page 4-23, line 6 and Figure 4-13. **Deficiency:** The isotope of uranium being discussed in this section is not presented. **Recommendation:** Present the uranium isotope discussed in this section.	Accept. Text will be clarified to indicate that the plume map provides values of total uranium and not a specific isotope. A similar clarification will be made on Table 4-1.
86	Section 4.1.2.3.1, page 4-32, line 17 **Comment:** Reference to 4.1.1.6.9 probably should be to 4.1.1.6.8.	Accept. Reference will be changed.
87	Section 4.1.2.3.2 page 4-33, first paragraph in this section. **Deficiency:** The ^{234}Th and ^{234}Pa isotopes are not considered fission products but rather decay products. ^{106}Ru would be considered probably relatively short-lived with a half-life of approximately one year. This radionuclide may have decayed away in certain gross beta plumes, as well as ^{131}I.	Accept. Text will be changed to indicate beta can be attributed to uranium fission and decay products. ^{106}Ru will be included with ^{131}I.
88	Section 4.1.2.3.2, page 4-33, line 17 **Comment:** Reference probably should be to 4.1.1.6.9.	Accept. Reference will be changed.
89	Section 4.1.2.3.4 page 4-34, also Sections 4.1.2.3.5 and 4.1.2.3.6. **Deficiency:** The ^{14}C isotope is not considered a true fission product but is formed from nitrogen or from ^{17}O. Cobalt-60 and nickel-63 would probably be considered activation products. **Recommendation:** Please check your information and make the appropriate changes, if necessary.	Accept. Text will be changed to state that ^{14}C, ^{60}Co, and ^{63}Ni are not fission products.
90	Section 4.1.2.3.8, page 4-35, line 18 **Comment:** Reference probably should be to 4.1.1.6.11.	Accept. Reference will be changed.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
91	Section 4.1.2.3.8 page 4-35 lines 27-28. **Deficiency:** The net electrical charge on soil organic matter is generally negative and does not tend to adsorb anionic species. However, oxyanions such as the technetate would tend to form complexes via ligand exchange with mineral oxyhydroxides such as iron or aluminum. Adsorption would increase with decreasing pH. **Recommendation:** Correct the statement.	Accept. Incorrect statement concerning sorbing of anionic species will be deleted.
92	Section 4.1.2.3.10, page 4-36, line 4 **Comment:** Reference probably should be to 4.1.1.6.12.	Accept. Reference will be changed.
93	Section 4.1.2.3.13 page 4-37 lines 16-27. **Deficiency:** The description of events here does not quite jibe with those conditions described in Section 4.1.1.6.13. What about the lack of annular seals in the monitoring wells adjacent to the cribs in question? The wells are not mentioned in Section 4.1.2.3.13. **Recommendation:** Please clarify the discrepancy between the two sections.	Accept. Statement concerning wells acting as a vertical conduit for uranium migration will be added to text.
94	Section 4.1.2.3.13, page 4-36, line 40 **Comment:** Reference probably should be to 4.1.1.6.13.	Accept. Reference will be changed.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
95	Section 4.1.2.3.14 page 4-38, lines 1-18. **Deficiency:** Are/are not organics found in the soils of the 200 West Area? This section reports organics present in the liquid discharges and yet several sections have alluded that organics are not present in the Hanford Site or 200 West soils to complex with various constituents. Are the organics present below the water table? It appears there may be some confusion between the presence or organic matter in Hanford soils and the disposal of organic wastes. **Recommendation:** Include some discussion of this apparent discrepancy in this section or elsewhere in this document.	Accept. Statements will be added to discussion of mobility of iodine-129 and technetium-99 regarding mobility with organics that may be present in soils due to waste disposal.
96	Section 4.1.2.3.14, page 4-37, line 38 **Comment:** Reference probably should be to 4.1.1.6.14.	Accept. Reference will be changed.
97	Section 4.1.3.1.1., page 4-39, line 35 **Comment:** Figure citation should start at 3-66	Accept. Citation will be changed.
98	Section 4.1.3.1.1, page 4-39, line 39 **Comment:** Citation of Figure 3-65 probably should be to Figure 3-66 and onward.	Accept. Citation will be changed.
99	Section 4.1.3.1.2, page 4-40, lines 14-15 **Comment:** On the comment that the "declines ... have been much less than expected" two factors come to mind. They are: 1) has delayed drainage from the partially saturated soil column been accounted for in the model, and 2) if the porosity is not correct the amount and timing of drainage may be incorrectly simulated.	Accept. Comment will be noted in text.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
100	Section 4.1.3.1.3, page 4-41, lines 6-7 **Deficiency:** This relationship is not proven as far as we know. A "may have" should be added to the statement. **Recommendation:** Provide data to support or remove.	Accept. "may have" will be added to the statement.
101	Section 4.1.3.2, page 4-43, whole section **Comment:** Two aspects of releases from the unsaturated zone are not adequately addressed. They include: 1) carbon tetrachloride free product is probably still in the soil in large quantities and may continue to migrate as a liquid and add to contamination a long time into the future, and 2) gravity drainage of contaminated groundwater containing a variety of contaminants may be greater than expected and may continue to be a problem into the future. The later depends on the concentration of contaminants in the pore water, the volume of pore water, and the timing of the drainage from the soil column. Line 21 -- Also note that vapor phase transport may be occurring for other volatile compounds not necessarily DNAPL compounds as described.	Accept. Comments will be added to text.
102	Section 4.1.3.3, page 4-44, line 22 **Comment:** Reference to 200 West probably means 200 East.	Accept. Will change 200 West to 200 East
103	Section 4.1.3.3, page 4-44, line 31 **Comment:** Word "savings" seems out of place, substitute "decrease" for it.	Accept. Will change "savings" to "decrease".
104	Section 4.1.3.3.6, page 4-45, line 33 "Chloroform also degrades..." to what?	Accept. Will add that chloroform also degrades to dichloromethane, chloromethane, and ultimately methane.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
105	Section 4.1.4, page 4-47, line 19 **Comment:** Reference to Figure 4-16 is unclear, that figure has nothing to do with gradient.	Accept. Reference will be changed to Figure 4-18.
106	Section 4.2.2 **Comment:** This section discusses the transport pathways expected to affect contaminants in the 200 West Groundwater Aggregate Area. A rationale should be provided for not including migration to sediments and uptake by biota. these pathways are included in Hanford Site Baseline Risk Assessment Methodology (DOE-RL 1991).	Reject. Migration to sediment and bio uptake are included in the conceptual model, Section 4.2.3 and Figure 4-20.
107	Section 4.2.2.1, page 4-49, paragraph beginning on line 37 **Comment:** Why not refer to Figure 3-55, "Isopach of the Vadose Zone"? On that figure the range of thicknesses is 55-100 meters.	Accept. Reference to Figure 3-55 will be added to the text and the thickness of the vadose zone will state a range of 55-100 m.
108	Section 4.2.2.1.3, page 4-51, line 18 **Comment:** The text refers to Section 3.5.4 for a discussion of the accumulation of soil moisture and liquid waste in perched water zones. There is no Section 3.5.4. The appropriate section to reference is likely 3.5.2.1.4. This discrepancy should be addressed.	Accept. Reference to 3.5.4 will be changed to 3.5.2.1.4.
109	Section 4.2.2.1.4 page 4-52, lines 30-36. **Deficiency:** Ionic strength also has a very important role in colloidal transport. As ionic strength goes up, suspended colloids (0.001 to 1 um) will coagulate to form larger particles which can be filtered out of suspension. Colloidal transport can be a large fraction of the total solution transport. **Recommendation:** Include ionic strength effects on colloidal transport in the discussion.	Accept. A discussion of the effect of ionic strength on suspended colloids will be added to the text.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
110	Section 4.2.2.1.6, page 4-54, line 22 **Comment:** Assuming "soil vapors" are largely made up of nitrogen with some carbon dioxide and water, there are very few volatile organic chemicals and no volatile radionuclides that are expected to be "lighter" than "soil vapors". Vapor transport, especially in the upward direction (toward the atmosphere) is more directly controlled by the vapor pressure of the volatile chemical and diffusion driven by a concentration gradient. Advection due to barometric pumping may also have some secondary influence on transport.	Accept. A discussion of diffusion driven and barometric pumping of volatiles will be added to the discussion of volatilization.
111	Section 4.2.2.2, page 4-54, line 37 **Comment:** Reference to Section 4.1.1.6.6 is unclear since it does not mention DNAPLs.	Accept. This reference will be deleted.
112	Section 4.2.2.4 page 4-56. **Deficiency:** This section probably should be labelled 4.2.2.3 rather than 4.2.2.4. The section 4.2.2.3 is apparently missing. **Recommendation:** Please make appropriate corrections.	Accept. Section will be labeled 4.2.2.3 rather than 4.2.2.4.
113	Section 4.2.2.4, page 4-56, line 39 **Comment:** The text states that lateral migration of carbon tetrachloride vapors was proposed as an explanation for detecting this chemical at distant locations. A reference for this explanation should be provided.	Accept. Reference will be added to text.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
114	Section 4.2.2.5 page 4-57, lines 23-27. **Comment:** This sentence states that based on the current plume configurations of tritium, groundwater contamination from the 200 West Area has not yet reached the Columbia River. However, nitrate concentrations if contoured down to 20 ppm might indicate that this constituent originates at sites other than U-pond within the 200 West Area and merges with the nitrate plume from the 200 East Area to flow to the Columbia River to the southeast. **Recommendation:** Please reevaluate this statement and make appropriate corrections, if necessary.	Reject. The statement has been reevaluated. The nitrate plume does merge with the nitrate plume from the 200 East Area, but sources of nitrate to the west of the 200 West Area apparently exist (see 20 ppm map by Evans et al. 1990). There are no other tritium sources or plume areas to the west of 200 West.
115	Section 4.2.3, page 4-59, line 10 **Comment:** The text states that absorption and desorption reactions may greatly retard lateral contaminant migration. Because of the possibility that desorption reactions may enhance lateral migration of contaminants, the text should be changed from retard lateral migration to alter lateral migration.	Accept. "Retard" will be replaced by "alter."
116	Section 4.2.3, page 4-59, line 24 **Comment:** This section discusses routes of exposure to contamination found in groundwater. Exposure to sediments is not mentioned. The text should be changed to indicate possible exposure to sediments. these exposure routes are included in Hanford Site Baseline Risk Assessment Methodology (DOE-RL 1991).	Accept. A statement will be added that states that exposure to sediments that have been contaminated by groundwater migration to surface water is a path of exposure.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
117	Section 4.2.4 First paragraph on page 4-60 and Table 4-5. **Deficiency:** Candidate Contaminants of Potential Concern does not contain all of the radionuclides and chemicals disposed of to S Plant (Table 2-10), T Plant (Table 2-9), Z Plant (Table 2-10), and U Plant (Table 2-9). The elimination of any chemical or radioactive constituent should be justified. **Recommendation:** Expand list to contain all radionuclides and chemicals dispersed at each source unit. Any elimination should be justified, and reason for elimination discussed.	Accept. Aluminum nitrate, calcium nitrate, ferric nitrate, hydrogen sulfide, magnesium nitrate, sodium oxalate, and sodium silicate will be added to Table 4-5.
118	Section 4.2.4 Third paragraph on page 4-60 and Table 4-6 **Deficiency:** The rationale for eliminating individual chemicals must be fully discussed in the text. Chemicals with no EPA toxicity criteria should not be eliminated, because they may have been released in large quantities to the environment. **Recommendation:** Discuss rationale for eliminating each chemical or radionuclide in sufficient detail to support decision.	Reject. The text states that chemicals with no EPA toxicity are included if they have known chronic toxic effects and are known to have been released in large quantities.
119	Section 4.2.4 Last paragraph on page 4-60 **Deficiency:** The selection of the contaminants of concern is based on groundwater regulations that were developed to protect human health, not environmental health. Thus, the screening procedure for the selection of the contaminants of concern is flawed. **Recommendation:** The criteria for selection should be expanded to include environmental receptors.	Reject. Assessment of ecological impacts will require a more detailed analysis (e.g., impacted species) and as well is a concern for the longer term rather than present conditions because of travel time to the Columbia. As a result, ecological risk must be left to the quantitative risk assessment phase rather than this screening study regarding short-term remediation decisions.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
120	Section 4.2.4.2 Top paragraph on page 4-62 **Deficiency:** Since it is likely that additional radionuclides were deposited to 200 West groundwater Aggregate Areas that were not included in the waste inventory, the development of the list of contaminants of potential concern (Table 4-6) may be premature. **Recommendation:** Propose a way to evaluate other radionuclides that were not included in the waste inventory that may have been introduced to the 200 West groundwater.	Accept. The list of contaminants of concern will be reviewed on an operable unit basis during the work plan development phase. This will allow both addition of contaminants which may be of local concern (from some operable unit studies) as well as possible deletion of constituents which are only found in other areas of the site.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
121	Section 4.2.4.2 page 4-64 lines 15 and 16 and Table 4-7 **Deficiency:** Cesium and cobalt are listed in the low mobility class with K_d > 100 based on the literature survey of Cantrell and Serne. This drastically conflicts with the classification based on the survey of Strenge and Peterson also shown in Table 4-7. The probable K_d of 500 mL/g for Cs from Table 4-7 also seems high based on previous laboratory work for Hanford soils reported in the Final EIS for the "Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes" (USDOE, 1989) which report a typical value of 26 mL/g which is more in line with the Strenge and Peterson estimate of 51 mL/g. **Recommendation:** Explain why the particular values for Cs and Co K_ds were chosen even though they conflict with other site-specific data which are more conservative. This explanation should be held in a context surrounding the correct usage of the K_d as a retardation factor in transport calculations. This usage requires that the K_d represents an instantaneous reversible equilibrium condition as discussed in Appendix P of the Final EIS. If the values listed are adsorption or desorption constants rather than true K_ds, then this should be clearly stated.	Accept. Tables and text will be checked against original sources and inconsistencies will be corrected.

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14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
122	Section 4.2.4.3 page 4-62 **General comment:** In discussing the mobility of contaminates in soil, there is no mention of the importance of the soil's oxidation/reduction potential. The chemical and biochemical states of many contaminants are highly dependent upon the redox status of the local soil environment. For example, technetium (Tc) is very sensitive to redox potential. Under well oxidized conditions, Tc exists as the pertechnetate anion which is characterized as being highly mobile. Under reducing conditions, Tc may become cationic and tends to be relatively immobile.	Accept. Redox potential state is discussed in regard to groundwater and mobility. Soil will be included in the discussion.
123	Section 4.2.4.5.1 page 4-66, line 27 **Comment:** The isotopes ^{210}Po, ^{210}Pb and ^{227}Ac should probably not be considered as fission products, but rather, decay products. **Recommendation:** Please change the wording "fission products" to "decay products".	Accept. "Fission products" will be changed to "decay products."
124	Section 4.2.4.5.2, page 4-66, line 40 **Comment:** This section discusses the carcinogenic and noncarcinogenic health effects of the candidate chemicals of concern. The references for this information, summarized in Table 4-11, should be provided.	Accept. Sources for this information are references indirectly in the footnotes/ reference will be made explicit.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
125	Figures 4-1 through 4-14 **Deficiency:** Wells used for contouring should be from the same depth in the aquifer. Using data from two wells adjacent to each other that sample the top and bottom of the water table will produce an erroneous concentration isopleth. **Recommendation:** Use only data collected from wells located in the upper portion of the water table aquifer.	Accept. Wells are in the process of being reevaluated to ensure that only wells located in the upper portion of the water table aquifer are used.
126	Figures 4-1 through 4-14 **Deficiency:** Some value just above the lower limit of detection LLD or more reflective of the MCL should be used for minimum concentration isopleth value. **Recommendation:** Add new isopleth contour(s) that reflect levels below those shown. The added data would provide additional definition to the plumes and may change some of the conclusions and recommendations in the text.	Reject. See response to Item 67.
127	Figures 4-1 to 4-16 **Comment:** Figures that are meant to be compared and show similar areas and ideas should share the same scale and orientation.	Accept. Scales and orientations are being standardized to the minimum number to best represent the data.
128	Figure 4-3, page 4F-3 **Comment:** The concentrations of fluoride in most of the wells are reported as zero value. The actual reported minimum detection limits or not detected should be indicated on the map. This comment is applicable wherever appropriate on other figures.	Accept. Figure 4-3 will be modified.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
129	Figure 4-5 **Comment:** The concentration isopleths shown on the figure extend far outside the area of monitoring wells shown on this or figs. 2-2, 11, and 12. **Recommendation:** In section 4.1.1.6.5, describe the basis for the extent of the plume as depicted on fig. 4-5.	Reject. Control wells are adequate to the east of the 200 West area to define the Nitrate plume.
130	Table 4-1, page 4T-1b **Comment:** Negative values are presented for minimum reported detection limits for many of the radionuclides. A footnote should be provided explaining the negative values used to report the minimum detection limits.	Accept. A footnote will be provided explaining that the random process of radioactive decay generates a range of background levels during sample counting that, when subtracted, can produce negative counts.
131	Section 5.1 Third paragraph on page 5-2 **Deficiency:** This paragraph stresses that this screening process is different from an evaluation of potential risks without explaining the difference. **Recommendation:** Clarify the difference between the steps in the screening and a full risk assessment. A check list comparison of each process would be helpful.	Accept. The difference between this screening and a quantitative RA will be explained.
132	Section 5.1, page 5-2, lines 21-28 **Comment:** Planning priorities for remediation should not ignore the confined aquifers (basalt and interbeds). Little is known about contamination concentrations in those aquifers and these represent real pathways from the 200 Areas to the accessible environment. These aquifers may be future sources of drinking or irrigation water at Hanford and they discharge to the Columbia River system.	Accept. However, this screening effort does not need to address confined aquifers in order to provide a valid prioritization of remediation actions.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
133	Section 5.2.1 Third and fourth bullet **Deficiency:** There is not sufficient detail on exposure pathways to determine if the screening process is adequate. **Recommendation:** List exposure pathways and assumptions. Additional information on MEPAS should be included in an appendix so the reader can make an evaluation without seeking other sources.	Accept. Additional text and tabular information will be provided to detail the MEPAS calculations.
134	Section 5.2.1, page 5-3 **Comment:** The section describes the Multimedia Environmental Pollutant Assessment System (MEPAS). It appears that MEPAS only considers human health effects. The method that MEPAS uses to determine ecological impacts should be explained in the text.	Reject. MEPAS does not explicitly address ecological risk. However, while ecology will ultimately be considered, it is not essential to this screening level prioritization.
135	Section 5.2.1, page 5-5, lines 9-10 **Comment:** The text states that risks from chemical carcinogens are based on cancer potency factors (CPF) defined in the Health Effects Assessment Summary for 300 Hazardous Constituents (EPA 1982). The CPFs should be obtained from the Integrated Risk Information System (EPA 1992a), if available or from the Health Effects Assessment Summary Tables (HEAST) (EPA 1992b). The rationale for not using the most recent data available should be provided.	Accept. The text will be clarified to indicate that IRIS is the first reference for CPF and HEAST is used as fallback source.
136	Section 5.2.1, page 5-5, lines 10-11 **Comment:** The text states that relative health risk index (RRI) for noncarcinogens is derived by multiplying the ratio of estimated dose to reference dose by 1×10^{-6}. Rational for using this technique should be provided.	Accept. Text will be clarified.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
137	Section 5.2.1, page 5-5, lines 28-30 **Comment:** A CPF of 1.7×10^{-2} is assigned to trichloroethylene based on HEAST. This value should be referenced to the appropriate HEAST document.	Accept. Reference will be corrected.
138	Section 5.2.1, page 5-6, line 6 This paragraph describes the use of K_d values to predict the mobility of inorganic contaminants in groundwater. The rational for not using the default K_d should be provided. Also, the text states that the K_d values in column three of Table 4-7 were used. The text should state what values were used when the values in the table were not available.	Accepted. Text will be clarified.
139	Section 5.2.1 First paragraph, page 5-5; Section 5.2.2, Second paragraph, page 5-6; Section 5.3.1 First paragraph, page 5-7. **General Comment:** There are areas where the methodology is not clear or appears inconsistent. **Deficiency:** The process described suggests that concentration is included in the RRI twice or three times--the first time to calculate the RRI, a second time for point RRI values, and a third time. **Recommendation:** Clarify and present the equations for unit RRI, total RRI, and any other types of RRI. Concentration should not be used more than once in calculating an RRI.	Accept. Text will be clarified.
140	Section 5.2.2, page 5-6, line 17 **Comment:** The text states that contaminants detected only once were not evaluated by MEPAS. An explanation for not evaluating these contaminants should be provided.	Accept. The statement will be expanded to indicate that, for screening purposes, unconfirmed invalidated data should not be used to base major remediation decisions.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
141	Section 5.2.3, page 5-6, paragraph beginning on line 40 **Comment:** Again, only unconfined aquifers are mentioned as potential pathways from the 200 Areas to the accessible environment. The confined aquifers are a subject that really needs to be more fully investigated.	Accept. Confined aquifers are identified as issue for data gaps. Confined aquifers are not the major mode of contaminant transport and so should not be used for screening purposes. No change to AAMSR.
142	Section 5.3.1, page 5-7, line 40 The text states that detections for some compounds were considered questionable, and those compounds were therefore not ranked. The reason for considering these detections questionable should be included. Also, describe any uncertainty that is added to the recommendation as a result of not including these compounds.	Reject. The main purpose of the screening is to make decisions regarding remediation. Contaminants with insufficient data will be addressed by LFI activities and, if found actually present, can then be proposed for remedial actions.
143	Section 5.3.1, page 5-7, line 42-43 **Comment:** The text states that RRI values have been combined for chemical and radiological carcinogens. It is suggested that chemical and radiological carcinogens contours also be presented separately in order to clearly define the relative importance of these carcinogens.	Reject. While non-carcinogens cannot be combined and compared to carcinogens int their effects, it is possible and appropriate to combine the carcinogens. The two can be assessed by their maximum relative risk indices in Table 5-2, however.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
144	Section 6.0 Pages 6-1 through 6-22 **Deficiency:** ARARs and action-specific CARS that may be applicable to the site and should be referenced include the following: Washington Standards for Protection Against Radiation (WAC 402-24 and 426-221) Washington Monitoring and Enforcement of Air Quality and Emission Standards for Radionuclides (WAC 402-80-050) Emission Standards and Controls for Sources Emitting Volatile Organic Compounds (173-490) **Recommendation:** Include the above regulations in the text.	Comment accepted in part. Washington Monitoring and Enforcement of Air Quality and Emission Standards for Radionuclides (WAC 402-80-050) should be included in the action-specific ARARs. However, it has been renumbered and should be referenced as follows: WAC 246-247-040. This requirement applies to dose limits of radionuclides to the air the public can be exposed to. Washington Standards for Protection Against Radiation (WAC 402-24 and 426-221) should not be included as we believe they are occupational standards and not environmental standards. They would not be applicable on the Hanford site. Emission Standards and Controls for Sources Emitting Volatile Organic Compounds (173-490) Does not apply to the Hanford Site. It applies to ozone non-attainment areas.
145	Section 6.0 Page 6-6, line 24. (RECHECK) **Deficiency:** There is a reference to Section 6.2.2.2 which does not exist. **Recommendation:** Please include the appropriate reference in the text.	Delete Reference to 6.2.2.2 from the text. No other reference is required.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
146	Section 6.6 Third paragraph on page 6-21 **Deficiency:** Point of compliance is not the boundaries of the Hanford site; see MTCA 173-340-720(6). (A) For groundwater the point of compliance is the point or points where the groundwater cleanup levels established under Subsections (2), (3), (4), and (5) of this section must be attained. Groundwater cleanup levels shall be attained in all groundwater from the point of compliance to the outer boundary of the hazardous substance plume. (B) The point of compliance shall be established throughout the site from the uppermost level of the saturated zone extending vertically to the lowest depth which could potentially be affected by the site. **Recommendation:** Accept above or reference a federal regulation that states that the point of compliance for groundwater could be the boundary of a hazardous waste site.	Accept. The Hanford Site boundary, or even a point beyond the Hanford Site boundary, is an appropriate point of compliance for many of the ARARs identified in Sections 6.2 through Section 6.4. As an example, the current text cites Clean Air Act regulations. In particular, federal NESHAPS establish the "maximally exposed individual" as the point of compliance for radionuclide emissions. This point is often beyond the Hanford Site boundary. Chapter 402-24 WAC, a potentially relevant and appropriate requirement, establishes maximum radionuclide effluent concentrations for "unrestricted" and "restricted" areas. The point of compliance where "unrestricted" limits may apply has generally been considered to be the Hanford Site boundary. While the MTCA section noted by the agency governs the establishment of the point of compliance under MTCA, and does state that the point of compliance will generally be established in a manner consistent with the agency's comments, the section goes on to state that "...Where hazardous substances remain on-site as part of the cleanup action, the department may approve a conditional point of compliance which shall be as close as practicable to the source of a hazardous substance, *not to exceed the property boundary.* Where a conditional point of compliance is proposed, the person responsible for undertaking the cleanup action shall demonstrate that all *practicable* methods of treatment are to be used in the site cleanup." (emphasis added). It is likely that hazardous substances will remain at some of the source units which contribute to the 200 East and 200 West Groundwater Aggregate Areas.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
147	Section 6.6 Third paragraph on page 6-21 **Deficiency:** The assumed point of compliance for radioactive species in groundwater is the point in the plume that exceeds MCL or Drinking Water Equivalent Level. **Recommendation:** Remove the last sentence in the paragraph (starting on line 33) and replace with sentence stating that point of compliance would be where MCL or Drinking Water Equivalent is exceeded.	Accept. See Response to comment 146 above.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
148	Section 6.7 First paragraph of page 6-22 **Deficiency:** Use the actual language stated in CERCLA Section 121 (d)(4)(A through F) rather than an interpretation. (A) the remedial action selected is only part of a total remedial action that will attain such level or standard of control when completed; (B) compliance with such requirement at that facility will result in greater risk to human health and the environment than alternative options; (C) compliance with such requirements is technically impracticable from an engineering perspective; (D) the remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation, through use of another method or approach; (E) with respect to a State standard, requirement, or limitation, the State has not consistently applied (or demonstrated the intention to consistently apply) the standard, requirement, criteria, or limitation in similar circumstances at other remedial actions within the State; or	Accept. The text will be replaced with the actual CERCLA language, with minor modifications made to improve readability in this context. Existing language related to Section 104-funded actions will be retained: it is recognized that the Section 104-funding waiver criteria will not apply to the Hanford Site; therefore, a paraphrase versus the longer actual language is appropriate.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
	(F) in the case of a remedial action to be undertaken solely under section 104 using the Fund, selection of a remedial action that attains such level or standard of control will not provide a balance between the need for protection of public health and welfare and the environment at the facility under consideration, and the availability of amounts from the Fund to respond to other sites which present or may present a threat to public health or welfare or the environment, taking into consideration the relative immediacy of such threats. The President shall publish such findings, together with an explanation and appropriate documentation.	
149	Section 7.0, Figures 7-4 and 7-5 **Comment:** The well on the left side of both of these figures is labeled as an injection well for pumping treated water back into the aquifer. The line representing the water table should show an elevated cone of impression around this well as opposed to a cone of depression as it is now.	Accept. Figures 7-4 and 7-5. The inversion cones depicted in the location of the injection wells will be replaced with a mound in each figure.
150	Section 7.1, page 7-3, lines 19 through 21 **Comment:** The remedial action objectives (RAO) should account for permanent reduction not only in the mobility and toxicity of the contaminants, but also in the volume of the contaminants. The text should be accordingly revised.	Accept. Text will be changed to include "or the reduction of volume" as a potential RAO. This is consistent with other statements in this section.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
151	Section 7.3.2 Third paragraph in this section, page 7-13. **Comment:** Apparently 22 options were retained as potentially applicable. Five were innovative and 16 remaining were retained. Five and 16 do not add up to 22. What happened to the extra option? Please make the appropriate correction.	Accept. Text will be corrected to accurately reflect the number of options indicated in Tables 7-3 and 7-4.
152	Section 7-4, page 7T-4 **Comment:** This table provides summary of retained groundwater technologies. None of the retained technologies except ion-exchange will remove nitrate from groundwater. But ion-exchange is an expensive treatment method. Denitrification is an anaerobic biological process in which the nitrate and nitrate forms of nitrogen are reduced to nitrogen gas. This is a common process routinely used in wastewater treatment plants and should be retained for nitrate removal from groundwater.	Accept. Tables will be expanded to include technology of denitrification. A footnote will be added to page 7T-4 to indicate the denitrification is highly selective to nitrate removal. Note: reverse osmosis is a retained technology in Table 7-4 which, like ion exchange, can remove nitrate from water.
153	Section 7.4.1 Second paragraph on page 7-16 **Deficiency:** There is known selective membrane technology that can be used to remove tritium from groundwater. One such system was developed by Techna Pacific Corporation, Inc. involving upstream electrolytic decomposition of water into hydrogen and oxygen, followed by the selective separation of hydrogen from other gases. The three forms of hydrogen are then separated into their respective streams: hydrogen, deuterium, and tritium. **Recommendation:** Remove sentence starting on line 17 ("Tritium, because...).	Accept. Text will be changed to reflect that for compounds like tritium, no large-scale treatment has been performed (rather than saying no treatment is possible), and that natural attenuation may be the feasible option. Tables will be expanded to include the technology of electrolytic decomposition followed by physical separation of resulting gases. The technology will be retained as an innovative technology, but rejected as a currently applicable technology for tritium plumes at the Hanford Site because of unproven effectiveness and expected high cost at this scale.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
154	Section 7.5 Fourth paragraph on page 7-24 **Deficiency:** Refer to above comments.	Accept. Text will be revised to recognize that some success in removing tritium from water has been obtained via the electrolytic decomposition followed by selective separation of the resultant gases, but that the success of this process on the large scale has not been demonstrated. Limitations will be summarized which focus on secondary waste generation (large quantities of gases which may or may not have economic value) and energy consumption (all treated water will be molecularly separated).
155	Figures 7-4 and 7-5 **Comment:** Injection wells will commonly create a mound as opposed to a cone or depression.	Accept. Figures 7F-4 and 7F-5 . The inversion cones for the injection well will be replaced with mounds (same as Comment 149).
156	Section 8.1.2, page 8-3, line 16 **Comment:** The topical reports are mentioned here and in 2.0, 3.0, and 4.0, but a comprehensive list of subject areas is never given. Such a list should be in this document. For instance, we did not see any mention of the topical report describing recent water quality sampling.	Accept. A list of topical reports is provided in 1.0. Drafting of the 200 AAMS groundwater sampling field activity report is in progress, and therefore is not available for incorporation into the 200 West Groundwater AAMSR. The topical report will be completed and released by the end of the calendar year.
157	Section 8.1.2 First paragraph on page 8-5 **Comment:** When will the 200 West Area borehole geophysical field characterization topical report be available? **Recommendation:** Date available should be referenced in this report.	Reject. Disagree with placing the completion date in this report. However, the topical report is scheduled to be completed by the end of the calendar year. Update on the status of the field reports is provided at the monthly unit managers meeting.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
158	Section 8.1.2 Second paragraph on page 8-6 **Deficiency:** All possible future land uses of the Hanford site should be addressed. Data will need to be collected that can be used to evaluate future land use. The issue is not just a regulatory one, and will affect the type and amount of data collected. **Recommendation:** Address all future land uses so appropriate amounts and types of data will be collected.	Reject. Land use is addressed in Section 7.0 to the extent considered appropriate for this type of scoping report.
159	Section 8.1.2, page 8-5, lines 29-32 **Comment:** The statement that "all these parameters are known to a reasonable degree of accuracy" may be optimistic. As pointed out in the review of Section 3, there is considerable difference between the tabular, text, and figure-based hydraulic data. This will need to be given much more review before being called "reasonable".	Accept. See responses to Comments 33, 36, 59, and 61. While the data are not perfect, they are known to a sufficient degree to allow most analysis (e.g., computer modeling) to be initiated. A data gap (Section 8.2.3) is included that additional aquifer property data are required.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
160	Section 8.1.3 **Comment:** Five PARCC parameters are identified and discussed in this section--Precision, Accuracy, Representativeness, Completeness, and Comparability. This discussion for most of the parameters covers both physical and chemical data, as it should. This discussion for "representativeness" only addresses physical data in the form of hydrogeologic and soils properties. No mention of the chemical monitoring data is made. It would seem that this "representativeness," the degree to which the appropriate environmental parameters or media have been sampled, is a very important aspect to cover. This can be carried back to Comment 42 on Section 4.1 and the potential for undocumented wastes and/or waste disposal sites--is the chemical data fully representative of the location and nature of subsurface contaminants in the 200 West Area?	Accept. A reference will be added to include chemical data in the "representativeness" description. See response to Comment 63.
161	Section 8.1.3 Bottom paragraph on page 8-6 **Comment:** Standard fate and transport models have a diffused front end of the contaminant plume, with a "core" of the highest concentrations behind the front.	Accept. Many plumes do have gradual contaminant gradients at their leading edge. Some models add to this phenomenon with numerical dispersion. The example cited is, however, a worst case which would strain the checking of analytical consistency.
162	Section 8.1.4 Second from bottom paragraph on page 8-9 and bottom **Deficiency:** Figure 4-18 shows the estimated near-future groundwater flow paths for the 200 Areas, and is not the conceptional model (Figure 4-20). **Recommendation:** Cite Figure 4-20.	Accept. Figure numbers will be checked and corrected.
163	Section 8.1.4, page 8-9, lines 29 and 36 **Comment:** Both lines have a reference to Figure 4-18, probably should refer to 4-20.	Accept. See response to Comment 162.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
164	Section 8.2.2.1 Pages 8-14 **Deficiency:** This section indicates that "the most important tools for characterization are models to address groundwater and vadose zone flow and contaminant transport" and refers to Table 8-1 as indicating the data requirements for such models. However, the title to the table indicates that it contains "Data Requirements for Modeling Flow and Transport in the Vadose Zone" alone. The table only barely mentions data requirements for modeling saturated flow in the unconfined aquifer (3.5 and 3.6) and completely ignores data requirements for modeling saturated flow in the confined aquifers (which may be required). **Recommendation:** Change the title of table 8-1 to include data requirements for modeling flow and transport in the confined and unconfined aquifers, and list the appropriate data requirements in the table. Also note in the text in Section 8.2.2.1 that modeling flow and transport in the confined aquifers will only be done if contaminants are found in these aquifers while addressing the data gaps noted in Section 8.2.3 on page 8-19. Also not in Section 8.2.3 that the physical and hydraulic properties of the confined aquifers exist as a data gap if these aquifers are found to be contaminated.	Accept. Table 8-1 will be augmented to include saturated flow modeling needs. Text modifications to Sections 8.2.2.1 and 8.2.3 will be made as recommended.
165	Section 8.2.2.2 Top paragraph on page 8-15 **Deficiency:** Confirmatory sampling and data analysis will be done at Level IV-CLP analysis level. **Recommendation.** State that Level IV-CLP analysis will be used for confirming data analysis.	Reject. Use of Level IV analysis for all sampling confirming screening detections is not a cost effective approach to decision making.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
166	Section 8.2.3 **Comment:** The presented data gap list is quite inclusive; however, three comments are offered. First, a data gap should be identified that relates to characterization of the geochemical properties of the earth materials in the vadose zone and the shallow unconfined aquifer. These properties may significantly influence contaminant migration and the effectiveness of remedial measures, and the report suggests that little information of this type has been collected to date. Second, a data gap should be identified that relates to identification of undocumented wastes and waste disposal sites (See Comment 42). Third, it would seem appropriate to rank or group/rank the data gaps. At present, all are presented equally and it must be assumed that all have the same priority in the minds of the authors, and that all will be pursued equally in subsequent studies (LFIs, RI, etc.). I would assume that this is probably not the case. The most significant data gaps or information needs, in my opinion, relate to the vertical extent of plumes and the hydrogeology of the lower portion of the unconfined aquifer and the confined aquifers.	Accept. The first data gap is mentioned in Section 8.3.3.2 but will be included (more clearly) in Section 8.2.3. Second point: See response to Comment 63. Third point: Ranking of data gaps tries to compress too much into a linear scheme. The relative importance of these issues may vary among the different operable units and occasionally among different contaminants. The suggested prioritization is better left to the Work Plan development process.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
167	Section 8.2.3 Fourth paragraph on page 8-19 **Deficiency:** Data is lacking in the lower portion of the uppermost, in particular at the interface between the gravel Unit E, and the lower mud sequence of the Ringold Formation. This area is critical in determining if Dense Nonaqueous Phase Liquid (DNAPL) contaminants have collected on this interface. DNAPL investigation is referenced in the May 27, 1992 EPA memorandum on groundwater remediation at Superfund sites (Directive No. 9283.1-06). The memorandum outlines the activities that should be performed at Superfund sites contaminated by DNAPLs including the evaluation of potential traps formed by soil layers. **Recommendation:** Incorporate and reference investigation methodology from the EPA memorandum on groundwater remediation at Superfund sites Directive No. 9283.1-06.	Reject. Reject placing the reference in the AAMSR. The directive will however, be recognized in work plans when appropriate. See general comment 7.
168	Section 8.2.3 Fourth paragraph on page 8-20 **Deficiency:** All radionuclides and chemicals disposed to the S, T, U, and Z Plants Aggregate Area Waste Management Units should be investigated. **Recommendation:** Investigate all radionuclides and chemicals known to have been disposed in the 200 West AAMS area.	Reject. Some selection process is appropriate to determine how to allocate analytical expenditures. Some released chemicals which are considered below concern may be investigated at a reduced level or not at all.
169	Section 8.2.3, page 8-21, section beginning on line 31 **Comment:** The term "pump test" is used to describe the test necessary to determine aquifer properties. In the supporting documents, the more correct term "aquifer test" is used.	Accept. The term "pump test" was intended to differentiate from slug test of aquifer properties. The term "pumping test" will be substituted.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
170	Section 8.2.3, page 8-23, section beginning on line 23 **Comment:** DNAPLs are mentioned here, in liquid phase these contaminants can move against the upward vertical gradient (and flow) in the groundwater system in response to geologic structures and gravity. DNAPLs in vapor phase can migrate through the unsaturated zone in the direction upgradient of groundwater flow. Transport in both phases is an important part of the contaminant transport conceptual model for the 200 West Area and this should be described to the reader.	Accept. DNAPLs and volatile organics are discussed in more detail in conjunction with the conceptual model (Section 4.1). A mention of the density gradient effect will be added. It is not appropriate to discuss vapor transport under this heading as the compounds are not in liquid form.
171	Section 8.2.2.3, page 8-17, line 30 **Comment:** This section discusses use of statistical package (GEO-EAS) to determine plume concentrations. This section should provide more information on the uncertainty associated with using such packages to facilitate an evaluation of the quality of data generated using this statistical package.	Reject. Geostatistical packages are mentioned here as a method for estimating uncertainty in interpolation. It is at best only of academic statistical interest to speak of the uncertainty of this uncertainty. Any analytical or statistical tool has to be viewed critically in regard to its practicality and potential for error.
172	Section 8.3.3, page 8-27 **Comment:** This section should include methodologies to be used to investigate all data gaps identified in Section 8.2.3. Some data gaps such as affects of old monitoring well construction, soil vapor phase transport, dense non-aqueous phase liquids, enhancement of contaminant transport by complexing, and best available remedial technology, are not addressed in this section, but are issues of concern at the 200 West Area.	Accept. We believe that these are covered by the categories of methodologies presented here, although the text will be revised to make this explicit.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
173	Table 8-4, page 8T-4C **Comment:** Analytical methods (ra-04) are proposed for radium and radium-226. Ra-04 is not defined, and a reference for this method is not cited. An explanation for not using the prescribed methods from the EPA guidance (EPA 1980) for analyzing radium and its isotopes should be provided in the text or in a footnote. Radium-223, -225, -226, and -228 are included in the contaminants of potential concern for the 200 West Groundwater Aggregate Area. But, the data quality objective parameters in this table include only radium, radium-225, and radium-226. Also, the same analytical methods are proposed for radium and radium-226. EPA (1980) prescribes different analytical methods for total radium alpha activity, radium-226, and radium-228. These discrepancies should be address, and the table should be corrected accordingly.	Accept. Table will be checked and corrected regarding the issues raised here.
174	Table 8-4, page 8T-4E **Comment:** Method 8240 is listed as the analytical method for methyl isobutyl ketone (MIBK) analysis. However, Method 8240 is not normally used for MIBK analysis. The method used most often for MIBK analysis is Method 8015.	Accept. Method 8015 will be specified for MIBK.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
175	Section 9.0 ERAs, page 9-2 **Comment:** Carbon Tetrachloride is considered a DNAPL and as such, probably will be difficult to remediate. It is also questionable how this constituent is mobilizing in the ground water. Before an ERA can be conducted there needs to be some degree of characterization of this constituent in the ground water. Is this constituent actually spatially mobile within the ground water? Is it travelling by vapor phase, rather than as a dissolved constituent in ground water? Hopefully, some of the concerns are being answered by the current Phase II Characterization effort which supports the ongoing 200 West Carbon Tetrachloride ERA.	Accept. Characterization of the mobilization and transport of carbon tetrachloride will be an important part of the 200-ZP-1 LFI Work Plan. We do not agree that more characterization is necessary before any ERA can be initiated on this plume, however. No change to AAMSR is needed.
176	Section 9.1.1 Second paragraph on page 9-5 **Deficiency:** Rather than use a "theoretical health or environmental risk," the quantitative risk assessment methodology outlined in the MSRS RAM should be used. **Recommendation:** Use a quantitative risk assessment methodology.	Reject. The purposes of a screening or scoping study are best served by a general consideration of risk rather than a full-scale risk assessment.
177	Section 9.1.1, page 9-6, line 16-24 **Comment:** The text states that the maximum concentration detected was averaged for all samples collected in a well from 1989 through April 1992. The rationale for evaluating an ERA based on averaged concentrations rather that maximum concentrations should be provided. In addition, contaminants exhibiting concentrations greater than 100 times the applicable standards are considered for ERA. A further explanation for implementing this EPA criteria should be provided.	Accept. The use of averages as appropriate for screening purposes (including selection of ERAs) will be noted in the description of the ERA selection process.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
178	Section 9.1.1 Second paragraph on page 9-7, and Table 9-1, page 2 of 3 **Deficiency:** Concerning tritium treatment technology, see comment 84.	Accept. See response to Comment 153. Text will be revised to indicate that tritium treatment technology is available but unproven on a large scale basis.
179	Section 9.2.1, page 9-9, lines 37-40 **Comment:** ERAs are proposed to be implemented with a stopping point based on either a concentration threshold, such as 100 times the applicable standards, or on reaching an asymptote on the remediation production curve. The basis for terminating an ERA upon reaching a point of diminishing returns should be stated (e.g., contaminant removal rates, cost per unit of contaminant treated).	Accept. The basis for terminating an ERA will be further developed in the planning package. (EE/CA) for the ERA rather than in the AAMSR.
180	Section 9.2.1.1, page 9-14, line 9 **Comment:** Reference to Figure 4-6 probably should be 4-5.	Accept. Figure references will be checked and corrected.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
181	Section 9.2.2 Page(s) 9-11 and 12 **Comment:** This section of the AAMS Report discusses the 5 contaminants proposed for direct application of Interim Remedial Measures (IRMs). As discussed in the second paragraph, IRMs are based on risk reduction. The response objective of an IRM can be a reduction in RRI or effective implementation of containment. It is our opinion that tritium must be considered for an IRM because it presents a high risk level and exceeds the MCL by more than 300 times. According to section 9.2.4.2 (p. 9-16), tritium has the fifth highest current carcinogenic RRI and the fourth highest future RRI level. Section 9.2.4.2 states that no ERA is proposed for tritium because "there is presently no commercially viable treatment systems to remove tritiated water from the groundwater". However, we feel that containment using hydraulic barrier and control systems is viable using proven, routine, and cost-effective technology. (We propose an FFS to demonstrate hydraulic containment technology - see Comment 102 below). Moreover, because of the relatively short half-life of tritium, containment will actually achieve a specific reduction in contaminant levels and RRI.	Reject. Containment is a viable technology, however, implementation of this technology on the scale required for Tritium is not considered to be consistent with an IRM. This technology will likely be implemented to some extent in association with IRMs (e.g., pump/treat./reinjection), and therefore, may accomodate tritium containment.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
	We believe that tritium should be addressed by an IRM rather than ERA because this is most consistent with the approach proposed in the AAMS report. Specifically, a multi-contaminant IRM has been proposed for the overlapping plumes of nitrate, ^{99}Tc, and uranium (see last sentence on page 9-2). Because the tritium plume also overlaps these other IRM contaminants, the most effective approach will be to include tritium in this multi-contaminant IRM. This will also help assure that remediation of nitrate, ^{99}Tc, and uranium does not increase the tritium RRI. **Recommendation:** Tritium should be included in the list of proposed contaminants for Interim Remedial Measures in Section 9.2.2. This can be accomplished by appropriately modifying section 9.2.4.2 and making it a subsection of 9.2.2. We further recommend that the last paragraph on page 9-2 and lines 4-5 on page 9-19 be modified to include tritium with nitrate, ^{99}Tc, and uranium in the proposed single multi-contaminant IRM for the overlapping plumes of these contaminants. Lines 34-35 on page 9-19 should be omitted. Entries for tritium in Tables 9-1 and 9-2 will require modification.	Reject. Tritium, although not specifically identified as an IRM, will be addressed in the N/Tc-99/U IRM locally.
182	Section 9.2.1.2, page 9-10, lines 27-28 The remedial alternatives for carbon tetrachloride plume treatment during an ERA include in-situ sparging in conjunction with a vapor extraction system. Carbon absorption is proposed as the method for treating the off gases from this system. However, thermal treatment and catalytic oxidation should also be considered for vapor phase treatment during the engineering evaluation/cost analysis for the ERA.	Accept. Will add bullet for carbon adsorption, thermal treatment, and catalytic oxidation as options to be assessed for vapor phase treatment.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
183	Section 9.2.2.1, page 9-11, line 15 **Comment:** Concentration listed as "the highest concentration" is 1,322 mg/l here and is 1,265 mg/l on line 19, page 4-11.	Accept. Concentration values will be checked and discrepancies resolved.
184	Section 9.2.2.1, page 9-11, line 19 **Comment:** Reference to Figure 4-5 probably should be 4-4.	Accept. Figure references will be checked and resolved.
185	Section 9.2.2.2, page 9-11, line 26 and line 30 **Comment:** Suggest a change from "first place" to "highest risk". On line 30, the reference to Figure 4-14 probably should be 4-13.	Accept. The terminology "highest relative risk" will be adopted. Figure references will be checked and resolved.
186	Section 9.2.2.3, page 9-11, lines 35-37 **Comment:** Line 35 - 27,000 should be 40,0000, see page 4-21 Line 36 - "six" should be "ten" Line 37 - reference to Figure 4-12 probably should be 4-11.	Accept. See response to Comments 183 and 184.
187	Section 9.2.2.4, page 9-12, line 3 **Comment:** Reference to Figure 4-7 probably should be 4-6.	Accept. Figure references will be checked and resolved.
188	Section 9.2.2.5, page 9-12, line 7 **Comment:** Reference to Figure 4-8 probably should be 4-7.	Accept. Figure references will be checked and resolved.
189	Section 9.2.3, page 9-14, lines 7-9 The text indicates that a program is underway to determine site background levels. The schedule for the completion of the effort should be provided in relation to approximate schedules for LFIs and IRMs.	Reject. The site background study is fairly long term and, as a site-wide study, is on a separate schedule from the AAMS. It may not be possible to include a schedule for this study. However, the results of the LFIs may be used in this study.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
190	Section 9.2.3 Page(s) 9-12..14 **Comment:** This AAMS Report section lists contaminants proposed for Limited Field Investigations (LFIs). LFIs are required where contaminants appear to be eligible for IRMs, but data are insufficient to confirm this, or where an IRM is known to be justified but existing data are insufficient to support an IRM. As stated on page 9-13, lines 27-28, some contaminant plumes for which an ERA or IRM is recommended also have portions where an LFI is recommended. We believe an LFI is required to evaluate DNAPL behavior and portions of the carbon tetrachloride plume. Section 9.2.1.1 proposes an ERA for this plume, but the ERA remediation alternatives discussed in section 9.2.1.2 appear to address primarily the dissolved phase. Section 8.2.3, page 8-23, lines 23-34 clearly identifies DNAPL behavior as a data gap. This conclusion is supported by the fact that only about 2% of the known discharge of carbon tetrachloride is accounted for in the mapped contaminant plumes (p. 4-14, lines 1-2). **Recommendation:** Include the DNAPL portion(s) of the carbon tetrachloride plumes with the proposed contaminants for LFIs listed in section 9.2.3.	Accept. LFI studies will address DNAPL aspects of the carbon tetrachloride plumes. The list of contaminants to be addressed as part of the LFIs specifically leaves out the higher ranked constituents, which will be addressed by an ERA or IRM, but will also have aspects for study under the LFI program. See response to Comment 175.
191	Section 9.2.3, page 9-14, line 33 **Comment:** Aquifer or pumping test is preferred over "pump test".	Accept. Suggested terminology will be used.
192	Section 9.2.4.2, page 9-16, line 2 **Comment:** Reference to 6,800,000 picoCi/l doesn't match same reference on pages 4-19 and 4-20.	Accept. Concentrations will be checked and resolved.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
193	Section 9.2.4.2, page 9-16, lines 11 through 13 The text states that no further investigation is required to delineate the tritium plume since it is well enough defined. But, in Section 4.1.6.10, the lateral extent of a small plume northeast of the main plume A in this area is uncertain. Hence, further investigation should be included to collect data for the risk assessment to confirm the need for remedial action in this area.	Accept. LFI activities will be proposed to target this area.
194	Section 9.2.4.2 First paragraph on page 9-16 **Deficiency:** Treatment technology for tritium does exist; refer to comment 84. **Recommendation:** See Comment 84.	Accept. See response to Comments 153, 154, and 178.
195	Section 9.3.1, pages 9-16 through 9-18 **Comment:** Two groundwater operable units are developed for the 200 West Groundwater Aggregate Area on the basis of the two existing groundwater flow regimes and the distributions of the contaminant plumes in the aggregate area. As seen in Figure 4-5, the carbon tetrachloride plume occupies the entire area of the 200 West groundwater aggregate area and overlaps other contaminant plumes. The data needs and remedial actions required for many of the contaminants may be similar. Hence, the investigation and remediation process would be more cost-effective if the entire 200 West groundwater aggregate area was studied concurrently. EPA and Ecology feel that given the current designation of 200-UP-1 and 200-ZP-1 as groundwater operable units, that additional discussions on the final definition of these operable units is required.	Accept. No change.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
196	Section 9.3.2, pages 9-18 and 9-19 **Comment:** Investigation prioritization is discussed for the priority groundwater contaminants in the 200 West Area. It is unclear whether the discussion is applicable for both of the proposed groundwater operable units. This discrepancy should be clarified. The text should also include a discussion on the prioritization of the proposed groundwater operable units.	Accept. The prioritization is not specific to either of these operable units. It will be the responsibility of the operable unit work plans to address the issues which are most pertinent to the areas covered by the operable units. This will be clarified. The prioritization of GW-OU-2 (i.e., 200-UP-1) over GW-OU-1 (200-ZP-1) is given on page 9-19, line 25.
197	Section 9.4.1 Page 9-28 **Comment:** This section of the AAMS Report proposes a Focused Feasibility Study (FFS) on barrier technology for groundwater remediation. We concur with this proposal; however, based on other sections of the AAMS, we suspect that the scope of the barrier FFS may be too limited. Section 7.4.1 discusses preliminary remedial action alternatives, including containment of groundwater. Lines 15-16, page 7-15 indicate that information on the entire range of remedial alternatives is provided. While Table 7-3 (p. 7T-3b) does list hydraulic containment as effective and implementable, only grouting and ground-freezing are considered among the remedial alternatives. In our experience, grouting and ground-freezing would be extremely expensive and uncertain technologies for groundwater containment under the depth and geologic conditions required in the 200 West Area. However, hydraulic containment by use of extraction and injection wells is an established and cost-effective technology in both deep underground construction and contaminant remediation.	Accept. Page 7-15, line 34 Alternative 1 will be changed to "Containment" and add "or dynamic systems using clean water injection" Page 7-17 change name of Alternative 1 to "Containment"--The text of Alternative 1 will be expanded to include a discussion of how injection of clean water could be used to form a containment barrier. The discussion will also highlight limitations to include mounding associated with injection (without removal of contaminated groundwater). Limitations such as potential dilution and expansion of the current plumes will also be included. Page 7-25, lines 7 and 8 the word "physical" will be eliminated in the Alternative 1 title. Table 7T-4, the containment column of table will be modified to include grout walls, freeze walls, and hydraulic. Page 9-28, line 22 bullet will be revised to list "containment" rather than "barriers," and will include hydraulic methods.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
	Use of injection and extraction wells for hydraulic containment is given passing mention in the AAMS as a spin-off of pump-and-treat remediation. While this is certainly a valid context for containment technologies, it must be noted that large sections of the 200 and 600 Areas are clean or relatively uncontaminated. Extraction and reinjection of cleaner groundwater has relatively little volume constraint and could, therefore, effect relatively large changes in hydraulic gradients and groundwater flow patterns. These changes could be engineered for control of contaminant migration, even though clean groundwater is being extracted and reinjected. Hydraulic containment using clean water extraction and reinjection is also unconstrained by the very complex treatment requirements associated with extraction of contaminated groundwater. In comparison with pump-and-treat systems, extraction of even very large volumes of clean groundwater for hydraulic containment should be relatively cheap.	

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
	Hydraulic containment is highly compatible with the observational approach advocated in the AAMS in which implementation is redirected as new information is obtained. In fact, considerable data will be generated on groundwater flow conditions by any hydraulic containment implementation. A form of hydraulic containment could be implemented by institutional controls on artificial recharge induced by irrigated agriculture upgradient and to the west of the 200 Areas. **Recommendation:** Expand the proposal in section 9.4.1 of a barrier FFS to explicitly include investigation of large scale hydraulic containment systems using extraction and reinjection of cleaner groundwater and using institutional controls on off-site artificial recharge. Similarly expand the discussions of containment alternatives in sections 7.4.1 and add a hydraulic containment alternative to section 7.6.	
198	Section 9.6 page 9-31, lines 24 **Comment:** It is somewhat premature to assign a number, "about ten wells" to answer the many questions concerning characterization of the "aggregate area". In our experience, the number of observation wells required is mainly defined by the complexity of the geology, geochemistry, and flow system; the Hanford Site and the 200 Areas are as complex as they come. Further development of an aggregate area project plan will be required before assigning a specific number of wells to this task.	Accept. Phrase will be removed. Selection of the wells will likely be made in operable unit work plans.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
199	Section 9.6 Page(s) 9-31..32 **Comment:** This section of the AAMS Report proposes 4 investigations to be conducted on an Aggregate-Area scale. We believe three additional technical issues require characterization on an Aggregate-Area or broader scale: I. Accounting for the volume of contaminants discharged on the Hanford site should be improved. Examples of discrepancies in current accounting range from under accounting by a factor of 50 (Known contamination of carbon tetrachloride is only 2% of known releases - p. 4-14, lines 1-2) to substantial over accounting (tritium observed in groundwater is about 15 times documented releases - p. 4-33, lines 31-34). More accurate accounting of contaminant discharges versus plumes would supplement decision-making criteria discussed in section 9.1.	Reject. We do not believe additional data for discharges will resolve the discrepancy issue. The data gap is not a major factor in the decision making process.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
	II. The relationship between geology and groundwater hydraulic parameters needs to be better characterized. This data gap was identified in section 8.2.3 (p. 8-21, lines 31-35). For example, the high transmissivity and hydraulic conductivity trends shown on Figures 3-53 and 3-54 appear to parallel structural trends in the basal Ringold units but not in the E gravel unit, the zone of greatest saturated thickness (Figs. 3-25..30). III. Characterization of the degree of interconnection between the shallow sedimentary and the deep basalt aquifers was identified as a data gap in AAMS Report section 8.2.3 (p. 8-22, lines 33-40) Additional investigation of this issue should utilize the extensive information compiled in 1986-1987 regarding the occurrence of ^{129}I and other radioisotopes in the deep aquifers, as summarized in the Intercontractor Working Group's *Data Compilation: Iodine-129 in Hanford Groundwater* (WHC-EP-0037) and other documents. **Recommendation:** Include recommendations for studies I, II, and III discussed above in Section 9.6.	Accept. A groundwater Transport Characterization recommendation will be added. Accept. This will be a part of the Groundwater Transport Characterization.
200	Section 9.3.2 Fourth paragraph on page 9-19 **Deficiency:** Justification for the prioritization for the LFIs is not given. **Recommendation:** Document the prioritization method used to rank the chemicals for LFIs.	Accept. A reason for the relative priorities will be given.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
201	Section 9.6 Third paragraph on page 9-31 **Deficiency:** Location of all proposed additional monitoring wells and depths should be shown on a figure. Given that some of the contamination is DNAPL, and the lack of information concerning the water table aquifer and the first aquitard, there is a large data gap that cannot by filled by ten wells. **Recommendation:** List and show on figure all proposed monitoring wells and the depth of screen interval.	Reject. This level of detail in describing the investigations is more appropriate for incorporating into the Work Plans. (See comment 198).
202	Table 9-2 **Deficiency:** Maximum concentrations shown on Table 9-2 for many detected constituents do not agree with maximum detections shown on Table A-2. **Recommendation:** Reconcile differences.	Reject. Table A-2 covers the complete time span of sampling, while Table 9-2 covers only samples after 1988.
203	Appendix A, Table A-7, page AT-7c **Comment:** A spot check revealed a discrepancy for well 299-W18-21, the test interval is 215.5-225.5 while the well log in the supporting document shows a screened interval of 195.5-225.5, which is correct? For well 299-W21-1, the test interval is listed as 239-2537 ft, this is probably an error.	Accept. Table will be checked for consistency. Data which may be in error in original sources cannot be corrected, however.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
204	Appendix A **Comment:** A spot check of hydraulic characteristics data in Tables A-7 and A-8 reveal the problems associated with interpreting aquifer test data. They also point out that the hydraulic characteristics of aquifers in the 200 Areas are not as well known as stated in the AAMS Report. This table also has discrepancies in the relationship between hydraulic conductivity, saturated thickness ("distance from water level to bottom of screen"?), and transmissivity.	Accept. Table will be checked and corrected as necessary.
205	Appendix A, Table A-7, page AT-7d **Comment:** For well 699-36-61B, the third line for that well shows a T value of 53,000. The following line shows a T value of 4200, with a note that the data were reanalyzed. This is a big change in T, although not unusual in our experience, aquifer test data are sometimes ambiguous.	Accept. Table will be checked and corrected as necessary.
206	Appendix A, Table A-8, page AT-8a **Comment:** Wells "W15-19" and "W18-21" are of similar depth, have similar appearing lithologic logs and are relatively close together (logs examined were found in the supporting documents). Their respective hydraulic conductivity values in this table are 1 and 5100. One ft/d is representative of sand or sand and gravel, 5100 ft/d is more like cobbles with some sand and/or gravel.	Accept. Table will be checked and corrected as necessary.
1	TYPOGRAPHICAL ERRORS Section 3.4.2.2.1, page 3-15, line 42 Delete phrase "from there" at end of sentence.	Accept. "from there" will be deleted.
2	Section 3.7.3., page 3-66, line 1 Phrase that begins "at the Hanford..." is a duplicate phrase.	Accept. Repeated phrase will be deleted.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
3	Section 4.1.1.6.12, page 4-23, line 4 Delete "range".	Accept. "range" will be deleted.
1	SUPPORTING DOCUMENTS: Hydrogeologic Model for the 200 West Groundwater Aggregate Area: Page 2-2, second paragraph, blanks where data values should be	Comments concerning supporting documents have been forwarded to the organization responsible for preparing those documents. There are currently no plans to revise the supporting documents commented on.
2	Page 2-2, page 2-6, Is this "Uppermost basal.." or "basalt"?	See response to supporting document comment 1 above.
3	Figures 2-3 to 2-17, see notes on AAMSR concerning similar figures. In that review, errors on figures presenting similar information were noted as a deficiency.	See response to supporting document comment 1 above.
4	Page 3-4, last paragraph, 2nd line has a reference to Figure 2-13 - does that mean 3-13?	See response to supporting document comment 1 above.
5	Page 3-5, last paragraph has several blanks were reference information is missing.	See response to supporting document comment 1 above.
6	Page 3-6, first paragraph has a blank where reference data is missing. Table 3-1, page 3-29, the K value for well "W26-11c" is 0.006 ft/d. This value is probably more representative of a silty sand and looks like an "outlier" as opposed to being representative of the unconfined aquifer. Was this test done on a saturated portion of the formation?	See response to supporting document comment 1 above.
7	Unconfined Aquifer Hydrologic Test Data Package Page 1, last paragraph, third line from the bottom typo after "Formation" "nd amy" may equal "and may."	See response to supporting document comment 1 above.
8	Table after page 2 is difficult to read to poor reproduction.	See response to supporting document comment 1 above.
9	Confined Aquifer Hydrologic Test Data Table 1, footnotes, footnote "h" is cited for well 699-52-57, but does not appear in the table.	See response to supporting document comment 1 above.

14. Item	15. Comment(s) (Provide technical justification for the comment and proposed action to correct or resolve the comment.)	16. Disposition (Provide brief justification if NOT accepted.)
	REFERENCES	
1	DOE-RL 1991. Hanford Site Baseline Risk Assessment Methodology. U.S. Department of Energy. Richland Field Office, Richland, Washington	
2	Ecology 1992. Statistical Guidance for Ecology Site Managers. Washington Department of Ecology. August 1992.	
3	EPA 1980. Prescribed Procedures for Measurement of Radioactivity in Drinking Water. EPA 600/4-80-032. U.S. Environmental Protection Agency. August 1980.	
4	EPA 1992a. Integrated Risk Information System. United States Department of Health and Human Services. National Library of Medicine Toxicology Data Network (TOXNET), Bethesda, Maryland.	
5	EPA 1992b. Health Effects Assessment Summary Tables: Annual FY-1992. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response, Washington, DC.	

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Subject: RESPONSE TO THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) AND THE STATE OF WASHINGTON DEPARTMENT OF ECOLOGY'S (ECOLOGY) REVIEW OF THE 200 WEST GROUNDWATER AGGREGATE AREA MANAGEMENT STUDY REPORT (AAMSR) DRAFT A

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